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# 1982 Row Crop Weed Control Guide

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This guide is based on the results of research conducted by the University of Illinois Agricultural Experiment Station, other experiment stations, and the U.S. Department of Agriculture. Consideration has been given to the soils, crops, and weed problems of Illinois.

Rainfall, soil type, method of application, and formulation influence herbicide effectiveness. Under certain conditions some herbicides may damage crops to which they are applied. In some cases, herbicide residues in the soil may damage crops grown later.

When selecting a herbicide, consider both the risk involved in using the herbicide and the yield losses caused by weeds. If cultivation and good cultural practices are controlling weeds, herbicides may be unnecessary. You can reduce risks by taking these precautions:

- Apply herbicides only to those crops for which use has been approved.
- Clean tanks thoroughly when changing from corn to soybeans, especially when using a postemergence herbicide.
- Use recommended rates. Applying too much herbicide is costly and in addition may damage crops and cause illegal residues. Using too little herbicide can result in poor weed control.
- Apply herbicides only at times specified on the label. Observe the recommended intervals between treatment and pasturing or harvesting of crops.
- Wear goggles, rubber gloves, and other protective clothing as suggested by the label.
- Guard against drift injury to nearby susceptible plants, such as soybeans, grapes, and tomatoes. Mist or vapors from 2,4-D, MCPA, and dicamba sprays may drift several hundred yards. Operate sprayers at low pressure with tips that deliver large droplets. Spray only on calm days or make sure air is not moving toward susceptible crop plants and ornamentals.
- Apply herbicides only when all animals and persons not directly involved in the application have been removed from the area. Avoid unnecessary exposure.
- Check label for proper method of container disposal. Triple rinse, puncture, and haul metal containers to an approved sanitary landfill. Haul paper containers to a sanitary landfill or burn them in an approved manner.
- Return unused herbicides to a safe storage place

promptly. Store them in original containers, away from unauthorized persons, particularly children.

• Since manufacturers' formulations and labels are sometimes changed and government regulations modified, always refer to the most recent product label.

This guide has been developed to help you use herbicides as effectively and safely as possible. However, since no guide can remove all the risk involved, the University of Illinois and its employees assume no responsibility for results of using herbicides, even if they have been used according to the suggestions, recommendations, or directions of the manufacturer or any governmental agency.

## Cultural and Mechanical Control

Most weed control programs combine good cultural practices, mechanical weed control, and herbicide applications. Good cultural practices to aid weed control include preparation of a good seedbed, adequate fertilization, crop rotation, seeding on the proper date, use of the optimum row width, and seeding at the rate for optimum stands.

Planting in relatively warm soils helps crops compete better with weeds. Good weed control during the first 3 to 5 weeks is extremely important for both corn and soybeans. If weed control is adequate during that period, corn and soybeans will usually compete quite well with most of the weeds that begin growth later.

Narrow rows will shade the centers faster and help the crop compete better with the weeds. However, if herbicides alone cannot give adequate weed control, then keep rows wide enough to allow cultivation. Some of the newer herbicides are improving the chances of adequate control without cultivation.

Use the rotary hoe after weed seeds have germinated but before most have emerged. Operate the rotary hoe at 8 to 12 miles per hour and weight it enough to stir the soil and kill the tiny weeds. Rotary hoeing also aids crop emergence if the soil is crusted.

If a preemergence or preplant herbicide does not appear to be controlling weeds adequately, use the rotary hoe while weeds are still small enough to be controlled.

Row cultivators also should be used while weeds are small. Throwing soil into the row can help smother small

weeds, but be careful not to cover the crop. If a banded herbicide has given adequate weed control in the row, use shields to prevent soil movement into the row during the first cultivation. Cultivate shallow to prevent injury to crop roots. Avoid excessive ridging; it may hinder harvesting and encourage erosion.

Herbicides can provide a convenient and economical means of early weed control by allowing delayed and faster cultivation. Furthermore, unless the soil is crusted, it is usually not necessary to cultivate at all when herbicides are controlling weeds adequately.

### Conservation Tillage and Weed Control

Conservation tillage is a concept in which the soil is protected from erosion by leaving crop residue on the soil surface, or by making the soil surface rough while efficient crop production is maintained. The most common conservation tillage systems are chisel, disk, and no-tillage. To gain the erosion-control benefit of conservation tillage, it is especially important that the soil surface be rough or at least partially covered with residue in the spring before and after corn or soybeans are planted.

The availability of a wide spectrum of effective herbicides has made it possible to use conservation tillage for producing corn and soybeans. Even with effective herbicides, however, the fear of poor weed control is probably the major deterrent to widespread adoption of conservation tillage systems.

A rough, cloddy soil surface or crop residue on the soil surface hinders chemical weed control in several ways. For example, clods that are not penetrated by the herbicide may later "melt down" creating untreated weedy areas. In addition, crop residue on the soil surface interferes with herbicide performance and with thorough incorporation.

Using implements for primary tillage other than the moldboard plow can also increase weed problems because they tend to leave a higher number of weed seeds on or near the soil surface. Because conservation tillage systems disturb the soil and roots much less than conventional systems, perennial weeds are likely to become more of a problem.

With conservation tillage, then, weed pressure is increased while overall herbicide performance is decreased. This situation presents a challenge to weed-control programs. To insure the success of your program, exercise greater care in choosing herbicides and application rates and try to make more accurate and timely applications. By using preemergence herbicides, you can get better distribution with less secondary tillage than with incorporated treatments, although the success of preemergence herbicides depends more upon rainfall.

In addition to preplant incorporated and preemergence herbicides, postemergence herbicides are also available. The effectiveness of postemergence herbicides in controlling grass has varied more than that of soil-applied treatments. Thus, because preplant, preemergence and post-emergence herbicides have definite advantages as well as

disadvantages, simply changing the time of application may not satisfactorily solve your weed-control problem.

To achieve satisfactory weed control with conservation tillage, you will need to apply herbicides at higher rates or use a sequence or combination of herbicides at higher rates. In any case, do not use a higher rate than indicated in the label instructions.

### Chemical Weed Control

Plan your chemical weed-control program to fit your soil, crops, weed problems, and farming operations. Herbicide performance depends on the weather and on wise selection and application. Your decisions on herbicide use should be based on the nature and seriousness of your weed problems.

Corn or soybeans occasionally may be injured by some of the herbicides registered for use on them. However, the benefits from weed control are usually much greater than the adverse effects. Crop tolerance ratings for various herbicides are given in the table on the last page of this article. Corn or soybeans under stress from soil crusting, depth of planting, or adverse weather are more subject to herbicide injury. Plants injured by a herbicide are likely to be more subject to disease.

Apply the herbicide at the time specified on the label. Select and apply herbicides at the correct rate in order to reduce crop injury. The application rates for most herbicides vary with soil texture and organic matter.

You must also consider the kinds of weeds likely to be present. The herbicide selectivity table at the end of this guide indicates the susceptibility of our most common weed species to herbicides.

Crop planting intentions for the next season must also be considered. Where high rates of atrazine or simazine are used, you should not plant soybeans, small grains, alfalfa, or vegetables the following year. If you are considering planting wheat after soybeans, be sure that the application of Treflan or similar herbicides for soybeans is uniform and sufficiently early to reduce the risk of injury to wheat or corn following soybeans. Refer to the herbicide label for cropping sequence information.

### Names of Some Herbicides

Trade	Common (generic)
AAAtrex, Atrazine	atrazine
Amiben	chloramben
Banvel	dicamba
Basagran	bentazon
Basalin	fluchloralin
Bicep	metolachlor + atrazine
Bladex	cyanazine
Blazer	acifluorfen
Bronco	alachlor + glyphosate
Butoxone, Butyrac	2,4-DB
Dowpon M	dalapon
Dual	metolachlor
Dyanap, Ancrack, Klean-Krop	naptalam plus dinoseb

Eradicane, Eptam	EPTC
Evik	ametryn
Furloe Chloro IPC	chlorpropham
Goal	oxyfluorfen
Hoelon	dichlofop
Laddok	bentazon + atrazine
Lasso	alachlor
Lorox	linuron
Milogard	propazine
Modown	bifenox
Paraquat	paraquat
Premerge 3	dinoseb
Princep, Simazine	simazine
Prowl	pendimethalin
Ramrod, Bexton, Propachlor	propachlor
Roundup	glyphosate
Sencor, Lexone	metribuzin
(several)	MCPA
(several)	2,4-D
Surflan	oryzalin
Sutan+	butylate
Tolban	profluralin
Treflan	trifluralin
Vernam	vernolate

Some herbicides have different formulations and concentrations under the same trade name. *No endorsement of any trade name is implied, nor is discrimination against similar products intended.*

### Herbicide Rates

Herbicide rates vary according to the time of application, soil conditions, the tillage system used, and the seriousness of the weed infestation. Sometimes lower rates are specified for preemergence application than for pre-plant incorporated application. Postemergence rates may be lower than preemergence rates if the herbicides can be applied at either time. Postemergence rates often vary depending on the size and species of the weeds and on whether an adjuvant is specified. Rates for combinations are usually lower than for herbicides used alone.

The rates for soil-applied herbicides usually vary depending on the texture of the soil and the amount of organic matter it contains. For instance, light-colored, medium-textured soils with little organic matter require relatively lower rates of most herbicides than do the dark-colored, fine-textured soils with medium to high organic matter. For sandy soils the herbicide label may specify "do not use," "use a reduced rate," or "use a postemergence rather than soil-applied herbicide," depending on the herbicide and its adaptation and on crop tolerance.

Reduced tillage systems usually require higher rates than conventional systems. Higher rates are especially necessary in the case of corn stubble, since considerable crop residue remains on the soil surface.

The rates given in this publication are, unless otherwise specified, broadcast rates for the amount of formulated product. If you plan to band or direct herbicides,

adjust the amount per crop acre according to the percentage of the area actually treated. Many herbicides have several formulations with different concentrations of active ingredient. Be sure to read the label and make the necessary adjustments when changing formulations.

### Herbicide Combinations

Herbicides are often combined to control more weed species, reduce carryover, or reduce crop injury. Some combinations are sold as a "package mix," while others are tank mixed. Tank mixing allows you to adjust the ratio to fit local weed and soil conditions. If you use a tank mix, you must follow restrictions on all products used in the combination.

Problems sometimes occur when mixing emulsifiable concentrate (EC) formulations with wettable powder (WP), water dispersible liquid (WDL), water dispersible granule (WDG), or dry flowable (DF) formulations. These problems can sometimes be prevented by using proper mixing procedures. Fill tanks at least one-third full with water or liquid fertilizer before adding herbicides. If using liquid fertilizers, check compatibility in a small lot before mixing a tankful. The addition of compatibility agents may be necessary. Wettable powders, WDGs, DFs, or WDLs should be added to the tank before ECs. Emulsify ECs by mixing with equal volumes of water before adding them to the tank. Empty and clean spray tanks often enough to prevent accumulation of material on the sides and the bottom of the tank.

Some of the herbicide combinations that have been registered are listed below. The herbicide listed first is the one that carries label or supplemental instructions on mixing. The label of the other herbicide(s) may also have mixing instructions.

#### Corn

- Atrazine + Princep (PPI, Pre, NT/P, NT/R)<sup>1</sup>
- Atrazine + propachlor (Pre, early Post)
- Banvel + atrazine (Post)
- Banvel + Lasso (Pre, early Post)
- Banvel + 2,4-D (Post)
- Basagran + atrazine (Post)
- Bexton + Bladex (Pre)
- Bladex + atrazine (Pre, PPI, Post, NT/P)
- Bladex + atrazine + Lasso (PPI, Pre)
- Bladex + Paraquat (NT)
- Bladex + Sutan+ (PPI)
- Dual + AAtrex (PPI, Pre, early Post, NT/P, NT/R)
- Dual + Princep (PPI, Pre, NT/P, NT/R)
- Dual + atrazine + Princep (PPI, Pre, NT/P, NT/R)
- Dual + Banvel (Pre, early Post)
- Dual + Bladex (PPI, Pre)
- Eradicane + atrazine or Bladex (PPI)
- Eradicane + Bladex + atrazine (PPI)
- Lasso + atrazine (PPI, Pre, early Post, NT/P, NT/R)
- Lasso + Bladex (Pre, PPI, NT/R)
- Lasso + Princep (NT/R)

Paraquat + atrazine (NT)  
Prowl + atrazine (Pre, early Post)  
Prowl + Banvel (Pre)  
Prowl + Bladex (Pre, early Post)  
Sutan + atrazine (PPI)  
Sutan + atrazine + Bladex (PPI)

#### Soybeans

Alanap + 2,4-DB (Post)  
Amiben + Lasso (Pre)  
Amiben + Lorox (Pre)  
Amiben + Sencor (Pre)  
Amiben + Surflan (Pre)  
Amiben + Treflan (PPI)  
Amiben + Treflan + Sencor or Lexone (PPI)  
Basalin + Sencor or Lexone (PPI)  
Dual + Amiben (PPI, Pre)  
Dual + Dyanap (Pre, early Post)  
Dual + Lorox (Pre, NT/P, NT/R)  
Dual + Sencor or Lexone (PPI, Pre, NT/P, NT/R)  
Dyanap + Lasso (Pre, early Post)  
Furloe + Lasso (Pre)  
Furloe + Treflan or Tolban (PPI)  
Furloe + Vernam (PPI)  
Goal + Treflan, Basalin, or Tolban (PPI)  
Goal + Lasso (Pre, NT/P)  
Lasso + Lorox (Pre, NT/P, NT/R)  
Lasso + Lexone or Sencor (Pre, PPI, NT/P), NT/R)  
Modown + Lasso (PPI, Pre)  
Modown + Treflan (PPI)  
Paraquat + Lorox (NT)  
Paraquat + Sencor (NT)  
Prowl + Amiben (Pre)  
Prowl + Lorox (Pre)  
Prowl + Sencor or Lexone (PPI, Pre)  
Sencor + Amiben (Pre)  
Sencor or Lexone + Treflan (PPI)  
Surflan + Dyanap or Klean-Krop (Pre)  
Surflan + Lorox (Pre, NT/P)  
Surflan + Sencor or Lexone (Pre, NT/P)  
Tolban + Sencor or Lexone (PPI)  
Vernam + Treflan, Tolban, or Basalin (PPI)  
Vernam + Amiben (PPI)

<sup>1</sup> PPI = preplant incorporated, Pre = preemergence, Post = postemergence, NT = no-till, NT/P = no-till with Paraquat, NT/R = no-till with Roundup.

The user can apply two treatments of the same herbicide (split application), or he can use two different ones, provided such uses are registered. Applying two herbicides at different times is referred to as a sequential or overlay treatment. Sequential treatment can be done in a number of ways. For example, a preplant application might be followed by a preemergence application, or a soil-applied treatment might be followed by a postemergence treatment. One herbicide may be broadcast while the other is banded or directed.

## Herbicide Incorporation

Herbicides are incorporated into the soil to increase their effectiveness. Some herbicides require incorporation to prevent their loss by volatility or photodecomposition. For herbicides that are not subject to volatility or photodecomposition, mechanical mixing into the soil is not imperative. However, incorporation provides more consistent weed control than surface-applied herbicides that rely on rainfall.

Optimum placement of a herbicide in the soil depends on the type of weeds to be controlled. Because annual weed seeds usually germinate from the top 1 or 2 inches of soil, most herbicides should be placed in that area for best results. Some herbicides are incorporated deeper (3 to 5 inches deep) in the soil to control large-seeded weeds or vegetative structures (tubers and rhizomes). They contain more stored food and can emerge from lower soil depths.

The depth and thoroughness of incorporation depend upon the type of equipment, depth and speed of operation, soil texture, and soil moisture. It is important to obtain uniform distribution, both horizontal and vertical, to prevent areas of high and low concentrations that may result in injury, residue, or poor control. Tandem disk harrows and field cultivators are the most commonly used tools for incorporation, although power-driven tillers, ground-driven seedbed conditioners, and combination tillage tools are also used.

#### Tandem Disks

Tandem disk harrows invert the soil profile in the same way as a moldboard plow, and usually place the herbicide deeper in the soil than most other tools used for incorporation. Travel speed and operating depth have the greatest effect on the vertical placement of herbicides. At the gang angle used, travel speed should be sufficient to move the soil at least the full distance of the blade spacing (usually speeds of 4 to 6 mph). Slower ground speeds can result in streaking of the herbicide.

The highest concentration of herbicide is generally found at  $\frac{1}{2}$  to  $\frac{3}{4}$  of the depth of operation. Increasing the depth of operation increases the depth of incorporation. At a depth of 4 to 5 inches, the herbicide is distributed within the upper 3 to 4 inches of soil, with the largest concentration in a layer  $2\frac{1}{2}$  to 3 inches below the soil surface.

Incorporation efficiency decreases as disk-blade diameter increases (for example, from 18 to 22 inches), and as the spacing between the blades increases (for example, from 7 to 9 inches). Disks with blades larger than 22 inches and spaced wider than 9 inches apart are considered primary tillage tools, and should not be used for incorporating herbicides.

Disk blade shape also influences the ability of a disk to mix soil. Spherical blades (recommended for cutting residues and preparing seedbeds) give better herbicide mixing than conical blades. Conical blades, designed for

penetration in heavy soil, are suitable for primary tillage but do not give uniform soil mixing.

One pass with a disk results in streaks of soil not mixed with herbicide. The addition of a coil-tine or spike-tooth drag harrow helps to level and mix the top layer of soil. Effectiveness diminishes as the disk is operated deeper than 3 to 5 inches because of limited soil penetration of the drag harrow. Two passes with a disk are recommended for thorough mixing, even when a harrow is used in combination with the disk. Preferably, the second pass should be made at an angle to the first pass. The timing of the second pass is not usually critical. If the herbicide is sufficiently covered on the first incorporation pass, the second pass can be delayed until the final seed-bed preparation immediately before planting.

When properly operated, a small tandem disk is a useful implement for incorporating herbicides. Two passes in soil with good tilth (with the equipment operating 3 to 4 inches deep at 4 to 6 mph) usually results in adequate soil mixing for consistent weed control.

### **Field Cultivators**

Field cultivators are used more than any other tillage tool for incorporating herbicides in Illinois. They are characterized by 2 or more rows of shanks (usually 3 rows) with an effective spacing of 6 to 9 inches (shanks spaced 18 to 27 inches apart on 3 tandem tool bars).

Travel speed, depth of operation, shank spacing, and the size of the points or sweeps determine the uniformity of incorporation. Shanks can be equipped with various points or sweeps, ranging from a 2-inch chisel point to 12-inch sweeps. Sweeps slice and lift the soil as the shanks are pulled through it. Sweep tilt, sweep size, and speed of operation all influence the amount of soil that is mixed. The effect of sweep size on incorporation is more important under adverse conditions (too wet or too dry) than under optimal soil conditions. The lack of soil flow in soils that are too wet or too dry can be partially compensated for by the greater surface area of a larger sweep.

A field cultivator will distribute the herbicide from the soil surface to about  $\frac{1}{2}$  to  $\frac{2}{3}$  the depth of operation. As sweep size increases, the herbicide is moved slightly deeper into the soil; under ideal soil conditions, however, the distribution is similar for 2-, 5-, 9- and 12-inch sweeps. Horizontal mixing of herbicides is erratic after one pass, even when followed by a coil-tine or spike-tooth drag harrow, but improves dramatically with a second pass made at an angle to the first pass.

The recommended operating depth for the field cultivator is 3 to 4 inches. It is usually best to operate a field cultivator only to the depth necessary to remove the tractor-tire depressions. The minimum ground speed for adequate incorporation varies with soil conditions and sweep size, but 6 mph is a practicable lower limit. The field cultivator must be operated in a level position. If the rear row of shanks is allowed to operate at a lower depth than the front gangs, untreated soil will be left on the surface, resulting in weed streaking.

Two passes are recommended to obtain uniform weed control. The second pass should be made at an angle to the first. Herbicides on a large number of acres are incorporated with only one pass, using the field cultivator. Pattern streaking occurs under certain conditions, resulting in erratic weed control. For this reason, two passes are recommended for uniform weed control. If herbicides are incorporated with only one pass, the use of wider sweeps on narrower spacings will increase the probability of obtaining uniform weed control.

Soil texture and soil moisture greatly affect the degree of soil mixing. Soil moisture content is extremely critical to the uniformity of incorporation obtained with all tillage implements. Excessive moisture results in soil stickiness and greatly reduces soil flow, particularly in heavy-textured soils. Field cultivators depend upon soil flow from the sweeps for mixing, and when used in wet soils, much of the herbicide is left in streaks on the soil surface.

In summary, there is not one incorporation technique that is best for all conditions. Several types of equipment are available that, if used properly, will provide adequate soil incorporation of herbicides under a variety of soil conditions.

### **Herbicides for Corn**

All herbicides mentioned in this section are registered for use on field corn and silage corn. Herbicide suggestions for sweet corn and popcorn may be found in *Circular 907, 1982 Weed Management Guide for Commercial Vegetable Growers*. Growers producing hybrid seed corn should check with the contracting company or inbred producer about tolerance of the parent lines.

#### **Preplant Incorporation**

Sutan+ and Eradicane should be incorporated immediately to minimize loss through vaporization. Incorporation is optional for many other soil-applied corn herbicides mentioned here. However, do not incorporate Banvel, Prowl, or propachlor. Preplant application should be done anytime during the 1 or 2 weeks prior to planting. Incorporation should distribute the herbicide evenly in the top 2 inches of soil. Incorporation of herbicides for which incorporation is optional may improve performance on some weed species, and if rainfall is limited it will improve performance on all susceptible weed species. However, do not apply herbicides too early or incorporate them too deep.

**Sutan+ (butylate) or Eradicane (EPTC)** may be applied anytime during the 2 weeks prior to planting. They should be incorporated immediately. Both herbicides are formulated with a crop safening agent to decrease the risk of corn injury. However, injury can still occur when growing conditions are unfavorable or when certain hybrids are used.

Sutan+ and Eradicane control the seedlings of annual grasses, shattercane, and johnsongrass. Eradicane will suppress wild proso millet. The suggested rate for these

herbicides used alone or in combinations is  $4\frac{3}{4}$  to  $7\frac{1}{2}$  pints per acre. Use the higher amount on heavy infestations of wild cane or yellow nutsedge or to suppress rhizome johnsongrass (see section on specific weed problems). A lower rate may be used on sandy soils.

You can control broadleaf weeds by tank mixing with atrazine or Bladex or by sequencing with an appropriate postemergence herbicide. The rate for combinations of Sutan+ or Eradicane with atrazine is  $1\frac{1}{4}$  to 2 pounds of atrazine 80W (2 to 3 pints of 4L), while the rate for Bladex is  $1\frac{1}{2}$  to  $3\frac{3}{4}$  pounds of Bladex 80W (2 to 6 pints 4L). A combination of atrazine plus Bladex with Sutan+ or Eradicane is also registered in Illinois.

#### *Preplant or Preemergence Herbicides*

Incorporation of the following herbicides is optional depending upon the weeds to be controlled and the likelihood of rainfall. Incorporation of these herbicides should be shallow but thorough.

AAtrex, Atrazine (atrazine), or Princep (simazine) can be applied anytime during the 2 weeks prior to planting, or soon after planting. Preplant incorporation of these herbicides controls weeds more effectively if rainfall is limited. Corn tolerance of atrazine and simazine is good, but carryover to subsequent crops can occur.

Princep controls fall panicum and crabgrass better than atrazine but is less effective in controlling cocklebur, velvetleaf, and yellow nutsedge. Princep is less soluble, but just as persistent, as atrazine. Thus, Princep is usually preplant incorporated. Princep plus atrazine can be used in 1:1 or 2:1 combinations; the total rate is the same as for atrazine used alone.

The rate for atrazine used alone is  $2\frac{1}{2}$  to  $3\frac{3}{4}$  pounds of atrazine 80W, 4 to 6 pints of 4L, or 2.2 to 3.3 pounds of AAtrex 90WDG. Atrazine controls annual broadleaf weeds better than it does grasses, and it is often used at reduced rates in tank mix combinations to improve broadleaf weed control. The rate for atrazine in combinations is  $1\frac{1}{2}$  to 2 pounds of atrazine 80W, 2 to 3 pints of atrazine 4L, or 1.1 to 1.8 pounds of AAtrex 90WDG. These rates may not provide adequate control of cocklebur, morningglory, and velvetleaf but can reduce the risk of carryover.

You can minimize carryover injury by mixing and applying the herbicides accurately, by applying them early, by using the lowest rates consistent with good weed control, and by tilling the soil thoroughly before planting susceptible crops. The risk of carryover is greater the year after a cool, dry growing season and on soils with pH over 7.3.

If you use atrazine at more than 3 pounds of active ingredient per acre or if you apply after June 10, plant only corn or sorghum the next year. If you use atrazine in the spring and must replant, then plant only corn or sorghum that year. Do not plant small grains, small seeded legumes, or vegetables in the fall or spring. Soybeans planted the year after an application of atra-

zine can also be injured from carryover, especially if you use Sencor or Lexone.

Bladex (cyanazine) does not persist in the soil as long as atrazine, but atrazine does have the advantage of better corn tolerance. Bladex controls fall panicum and giant foxtail, but not broadleaf weeds, better than atrazine. Bladex can be combined with atrazine at 3:1, 2:1, or 1:1 ratios of Bladex to atrazine (see label for rates). The higher ratios will provide better grass control, while the 1:1 ratio will provide better broadleaf weed control.

Rates of Bladex must be selected accurately on the basis of soil texture and organic matter to reduce the possibility of corn injury. Rates are  $1\frac{1}{2}$  to 5 pounds of Bladex 80W, 1.2 to 4 quarts Bladex 4L, or 8 to 27 pounds of Bladex 15G per acre. You can lessen the risk of corn injury by using reduced rates of Bladex in combinations.

Bladex can be tank mixed with Lasso, Dual, propachlor, or Prowl to improve grass control. The Lasso or Dual combination can be applied immediately prior to planting or after planting. Do not incorporate the Prowl or propachlor combinations.

Lasso (alachlor) or Dual (metolachlor) can be applied preplant incorporated or at the preemergence stage. Preplant incorporation will improve control of yellow nutsedge and can lessen dependence upon rainfall. Incorporation should distribute the herbicide evenly in the top 2 inches of soil.

Lasso and Dual control annual grasses and help control yellow nutsedge. You can improve broadleaf weed control by using atrazine or Bladex in preplant combinations or by using atrazine, Bladex, or Banvel in preemergence combinations.

Lasso can be applied anytime during the week before planting corn and incorporated evenly into the top 2 inches of soil, or it can be used immediately after planting. The rate is 2 to 4 quarts of Lasso 4E or 16 to 26 pounds of Lasso 15G. Use the higher rate for the soil if you plan to incorporate Lasso.

Dual can be applied anytime during the 2 weeks prior to planting corn and incorporated into the top 2 inches of soil, or it can be used immediately after planting. The rates are  $1\frac{1}{2}$  to 3 pints of Dual 8E per acre.

Lasso or Dual plus atrazine can be applied preplant incorporated or after planting until corn is 5 inches tall and grass weeds are no larger than the 2-leaf stage. Do not apply with liquid fertilizer after the crop emerges. The suggested rate is  $1\frac{1}{2}$  to  $2\frac{1}{2}$  quarts of Lasso or  $1\frac{1}{4}$  to  $2\frac{1}{2}$  pints of Dual 8E plus  $1\frac{1}{2}$  to  $2\frac{1}{2}$  pounds of atrazine 80W, 1 to 2 quarts of atrazine 4L, or 1.1 to 2.2 pounds of AAtrex 90WDG. Dual is also cleared in a combination with atrazine plus Princep.

Dual and Lasso are both formulated as packaged mixes with atrazine. Bicep contains  $2\frac{1}{2}$  pounds of metolachlor (Dual) and 2 pounds of atrazine per gallon. The rate is 2 to 4 quarts per acre. Lasso and atrazine (flowable) contains  $2\frac{1}{2}$  pounds ofalachlor (Lasso) and  $1\frac{1}{2}$  pounds of atrazine per gallon. The rate is  $3\frac{1}{2}$  to  $4\frac{1}{2}$  quarts per acre.



Dual or Lasso plus Bladex can be applied prior to planting and incorporated, or they can be applied during the preemergence stage after planting. The rate is 2 to 2½ quarts of Lasso 4E or 1¼ to 2½ pints of Dual 8E plus 1 to 3 pounds of Bladex 80W or 1.6 to 4.8 pints of Bladex 4L. Adjust the rate carefully according to soil texture and organic matter. Lasso plus Bladex plus atrazine is also registered for use in Illinois.

#### Preemergence Herbicides

Banvel (dicamba) plus Lasso or Dual can be applied after planting until corn is 3 inches high, but before grasses reach the 2-leaf stage. The addition of Banvel improves control of broadleaf weeds without creating a risk of carryover injury. Banvel may injure corn, especially if recommended rates are exceeded, applications are not accurate and uniform, or if corn is planted too shallow (less than 1½ inches). Do not use this treatment on coarse-textured soils or soils that are low in organic matter. The rate on soils with over 2½ percent organic matter is 1 pint of Banvel plus 2½ quarts of Lasso 4E, or 2 to 2½ pints of Dual 8E per acre.

Ramrod, Bexton, or Propachlor (propachlor) can be applied alone or with atrazine after the corn is planted but before grasses reach the 2-leaf stage. Granular formulations should be applied before crop or weeds emerge. Propachlor performs well on soils with over 3 percent organic matter.

Propachlor is irritating to the skin and eyes, so observe label precautions. Corn tolerance to propachlor is good. It controls annual grasses and pigweed. The rate is 4 to 6 quarts of propachlor 4L or 20 to 30 pounds of propachlor 20G per acre.

Propachlor can be mixed with atrazine or Bladex to improve broadleaf weed control. The rate is either 2½ to 4 quarts of propachlor 4L plus 1½ to 2 pounds of atrazine 80W (1.2 to 1.6 quarts of 4L) or 1½ to 2¼ pounds of Bladex 80W (1.2 to 1.8 quarts of 4L) per acre.

Prowl (pendimethalin) is registered only for use on corn after planting. Incorporation of Prowl may result in serious corn injury. Use only where it is possible to cover seed adequately with soil. Prowl can control annual grasses and pigweed and provides some control of smartweed and velvetleaf. You can improve broadleaf weed control by combining Prowl with atrazine, Bladex, or Banvel. Prowl plus atrazine or Bladex may be applied in the early postemergence period before grasses are in the 2-leaf stage. These combinations may also help reduce the competition from wild proso millet. The rate for such combinations is 1 to 1½ quarts of Prowl 4E. Do not use Prowl plus Banvel on sandy soils or soils with less than 1½ percent organic matter.

#### Postemergence Herbicides

Lasso, Dual, propachlor, or Prowl plus atrazine as well as Lasso or Dual plus Banvel can be used on corn between the preemergence and very early postemergence

stages (see preemergence section). To get satisfactory control apply before grasses reach the 2-leaf stage. Treflan is also labeled as a postemergence incorporated treatment in corn which is at least 8 inches in height. Treflan can be applied broadcast or directed and incorporated immediately with a cultivator.

Banvel plus atrazine can be applied up to 3 weeks after planting but before annual grasses are 1½ inches high. The rate is ½ pint of Banvel plus 1½ to 2 pounds of atrazine 80W or 1 to 1.6 quarts of atrazine 4L.

Atrazine can be applied before grass weeds are more than 1½ inches high. Many annual broadleaf seedlings are more susceptible than grass weeds and may be treated until they are up to 4 inches tall.

The addition of nonphytotoxic oils, oil-surfactant mixes, or surfactants has generally increased the effectiveness of postemergence atrazine. The nonphytotoxic oil is used at 1 gallon per acre. Crop-oil concentrates (80 percent oil and 20 percent surfactant) are used at the rate of 1 quart per acre. Surfactants are usually added at 0.5 percent of the total spray volume or about 1 pint per acre. Results with the oils and oil-surfactant mixes have generally been better than those with the surfactants.

Applications of atrazine and oil sometimes damage corn that has been under stress from prolonged cold, wet weather, or other factors. Do not use more than 2½ pounds of atrazine 80W or 2 quarts of atrazine 4L per acre if you mix with oil or oil concentrate. Do not add 2,4-D to the atrazine-oil treatment or severe injury may result. Mix the atrazine with water first and add the oil last. If atrazine is applied after June 10, do not plant any crop except corn or sorghum the next year.

Bladex (cyanazine) can be applied through the 4-leaf stage of corn growth but before weeds exceed 1½ inches in height. The rate is 1½ to 2½ pounds of Bladex 80W per acre. (Do not use Bladex 4L.) A mixture of Bladex + atrazine is also registered for postemergence use. Injury to corn may occur under cold, adverse growing conditions. The injury may only be temporary yellowing, but can be more severe. Certain agricultural surfactants or vegetable oils may be added to Bladex, but do not use petroleum crop oils or apply with liquid fertilizers for postemergence application.

Banvel (dicamba) can be applied either early or late in the postemergence stage. If you apply it early, use it at a rate of ½ to 1 pint per acre anytime after planting until corn is 5 inches high. The best time to apply is at the first flush of broadleaf weeds. Banvel should be used in a sequential treatment with a grass herbicide such as Lasso, Dual, or Sutan+. Such timing allows for better crop tolerance than the preemergence treatments with Banvel, permits a higher rate than the later postemergence treatment, and diminishes the likelihood of significant soybean injury.

Banvel should be applied before soybeans in the area

are 10 inches high. Soybean yields are seldom reduced when slight injury occurs early. However, yields can be reduced if severe injury occurs when soybeans are blooming or during pod fill. Banvel also can injure other susceptible plants, such as vegetables and ornamentals. Use extreme caution to avoid injury to desirable plants from either contaminated sprayers or drift of Banvel from treated areas.

Banvel may be applied until corn is 3 feet high or until 15 days before tasseling. When spraying near soybeans, do not spray corn after it is 2 feet high. If corn is more than 8 inches high, drop nozzles give better weed coverage and reduce drift. If you direct the nozzles toward the row, adjust the spray concentration so that excessive amounts are not applied to the corn. The broadcast rate is ½ pint per acre.

Do not use Banvel on sweet corn, popcorn, or seed corn. Do not graze or harvest corn for dairy feed before the ensilage (milk) stage.

A mixture of ½ pint of Banvel plus ½ pint of 2,4-D amine (4 pounds per gallon) per acre may present less risk of corn injury than 2,4-D alone. Use drop nozzles on corn more than 8 inches high when using the Banvel-plus-2,4-D mixture.

**2,4-D** is an economical and effective treatment for controlling many broadleaf weeds in corn. Use drop nozzles if corn is more than 8 inches high to decrease the possibility of injury. If you direct the nozzles toward the row, adjust the spray concentration so that excessive amounts are not applied to the corn.

Do not apply 2,4-D to corn from tasseling to dough stage. After the hard dough to dent stage, you can apply 1 to 2 pints of certain 2,4-D's by air or high clearance equipment to control late-germinating broadleaf weeds that may interfere with harvest, or to suppress certain perennial weeds.

The suggested broadcast rate of acid equivalent per acre is ⅓ to ¼ pound of ester formulations or ½ pound of amine. This would be ⅓ to ½ pint of ester or 1 pint of amine for formulations with 4 pounds of 2,4-D acid equivalent per gallon.

The ester forms of 2,4-D can vaporize and injure nearby susceptible plants. This vapor movement is more likely with high-volatile than with low-volatile esters. Spray particles of either the ester or the amine form can drift and cause injury.

Corn is often brittle for 7 to 10 days after application of 2,4-D and thus is susceptible to stalk breakage from high winds or cultivation. Other symptoms of 2,4-D injury are stalk bending or lodging, abnormal brace roots, and failure of leaves to unroll.

High temperature and high humidity will increase the potential for 2,4-D injury, especially if corn is growing rapidly. If it is necessary to spray under these conditions, it may be wise to reduce the rate by about 25 percent. Corn hybrids differ in their sensitivity, and the probability of injury increases when corn is under stress.

**Basagran (bentazon)** is registered for postemergence use in corn in a manner similar to that for soybeans (see soybean section). Since corn is quite tolerant of Basagran, the addition of a crop-oil concentrate is considered relatively safe. Basagran is also cleared in combination with atrazine plus oil at the rate of 1 to 1½ pints of Basagran plus atrazine at 0.6 to 0.9 pound of 80W, 0.6 to 0.8 pound of 90WDG, or 1 to 1½ pints of 4L per acre. Oil concentrate is added at 1 quart per acre for control of annual broadleaf weeds only. The combination is more economical than Basagran alone and will reduce the carryover potential from atrazine alone.

Laddok is a mixture of 1⅓ pounds bentazon (Basagran) plus 1⅓ pounds of atrazine per gallon. It can be used to control broadleaf weeds in corn with 1 to 5 leaves. The rate is 2.4 to 3.6 pints Laddok plus one quart of crop oil concentrate per acre.

#### *Directed Postemergence Herbicides*

Directed sprays are sometimes needed for emergency situations, especially when grass weeds become too tall for control with cultivation. However, weeds are often too large for directed sprays to be effective. Directed sprays cannot be used on small corn because a height difference between corn and weeds is needed to keep the spray off the corn. Corn leaves that come into contact with the spray can be killed, and injury may affect yields.

**Lorox (linuron)** may be applied as a directed spray after corn is at least 15 inches high (free standing) but before weeds are 8 inches tall (preferably not more than 5 inches). Lorox controls grass and broadleaf weeds.

The broadcast rate is 1¼ to 3 pounds of Lorox 50W per acre, depending on weed size and soil type. Add Surfactant WK at the rate of 1 pint per 25 gallons of spray mixture. Cover the weeds with the spray, but keep it off the corn as much as possible. *Consider this an emergency treatment.*

**Evik 80W (ametryn)** is registered for directed use when corn is more than 12 inches tall and weeds are less than 6 inches tall. Evik should not be applied within 3 weeks of tasseling. The rate is 2 to 2½ pounds Evik 80W per acre (broadcast) plus 2 quarts of surfactant per 100 gallons of spray mixture. Extreme care is necessary to keep the spray from contacting the leaves. *Consider this an emergency treatment.*

#### **Herbicides for Soybeans**

Consider the kinds of weeds expected when you select a herbicide program for soybeans, especially when growing soybeans in narrow rows. The herbicide selectivity table (see last page) lists herbicides and their relative weed control ratings for various weeds.

Soybeans may be injured by some herbicides. However, they usually outgrow early injury with little or no effect on yield if stands have not been significantly reduced. Significant yield decreases can result when injury occurs



during the bloom to pod fill stages. Excessively shallow planting may increase the risk of injury from some herbicides. Accurate rate selection for soil type is especially essential for Lorox, Lexone, and Sencor. Do not apply Lorox, Lexone, Sencor, Modown, or Goal after soybeans have begun to emerge. Follow label instructions as to rates, timing, incorporation, and restrictions.

#### **Preplant Herbicides**

Incorporation is required for Basalin, Tolban, Treflan, and Vernam. Incorporation is optional for Amiben, Dual, Lasso, Modown, and Prowl when used alone and in some combinations. Dyanap, Lorox, and Surflan should not be incorporated. Incorporation can improve performance if rainfall is limited and may increase the effectiveness of Dual or Lasso in controlling nutsedge. Incorporation should distribute the herbicide evenly in the top 1 to 3 inches of soil. Deep incorporation or very early application of the herbicide can cause significant reductions in weed control.

**Dinitroaniline herbicides** registered for weed control in soybeans are Basalin, Tolban, Treflan, Prowl, and Surflan. Basalin, Treflan, and Tolban should be incorporated because of their low solubility and because of surface loss through vaporization and photodecomposition. Incorporation is optional with Prowl, but variable weed control and soybean injury may result from preemergence applications. Do not incorporate Surflan (see preemergence section).

How early you apply a dinitroaniline herbicide depends on the particular herbicide and on whether it is applied alone or in combinations. Combination treatments usually call for application within 7 to 14 days of planting. Too early an application followed by delayed planting may result in poor weed control. How long you delay incorporation depends on the herbicide, but delaying incorporation may lead to loss of herbicide from erosion, photolysis, or vaporization. Incorporation should distribute the herbicide evenly in the top 2 to 3 inches of soil (see label for implement settings). A deeper incorporation may improve shattercane and johnsongrass seedling control. Basalin, Tolban, Prowl, and Treflan may be used for rhizome johnsongrass suppression (see section on specific weed problems).

The dinitroaniline herbicides control annual grasses, pigweed, and lambsquarters and may provide some control of smartweed and annual morningglory. Prowl and Surflan may also partially control velvetleaf. However, acceptable control of most other broadleaf weeds requires combinations or sequential treatments with other herbicides. Sencor or Lexone can be tank mixed with any of the dinitroaniline herbicides.

The dinitroaniline herbicides provide similar weed control, soybean tolerance, and persistence when recommended rates are used. Soybeans are sometimes injured by dinitroaniline herbicides. Plants that have been injured by incorporated treatments are stunted and develop swollen hypocotyls and shortened lateral roots.

Such injuries are not usually serious. Plants injured by preemergence applications develop stem callouses at the soil surface, which can cause lodging and yield loss.

Crops of corn, sorghum, or small grains may be injured if they are grown subsequent to a soybean crop that has been treated with a dinitroaniline herbicide. The symptoms are poor germination and stunted, purple plants with poor root systems. To avoid carryover use no more than the recommended rates. Also, be sure that application and incorporation are uniform. The likelihood of carryover increases with double cropping or late application and after a cool, dry season. Disking or chisel plowing provides for minimal dilution of herbicide residues.

**Treflan (trifluralin)** can be applied alone anytime in the spring. Combinations with Sencor or Lexone should be applied no more than 2 weeks prior to planting, while combinations with Amiben, Furloe, or Modown should be applied within a few days prior to planting. Incorporate as soon as possible, but do not delay incorporation more than 24 hours (8 hours if soil is warm and moist). The rate is 1 to 2 pints of Treflan 4E or 10 to 20 pounds of Treflan 5G per acre.

**Tolban (profluralin)** should be applied within a few days prior to planting soybeans. Incorporate within 4 hours of application. The rate is 1 to 3 pints of Tolban 4E per acre. Combinations may allow lesser amounts, although to control shattercane you may need to use the higher rate. Tolban can be tank mixed with Sencor, Lexone, or Furloe to improve broadleaf control. Tolban will no longer be manufactured, but current supplies may be used.

**Basalin (fluchloralin)** can be applied anytime during the 8 weeks (alone) or 1 to 2 weeks (with Sencor or Lexone) prior to planting. Incorporate within 8 hours of application. The rate is 1 to 3 pints Basalin 4E per acre. Basalin can be combined with Sencor or Lexone to improve broadleaf weed control.

**Prowl (pendimethalin)** can be applied within 60 days (alone) or 7 days (with Sencor or Lexone) prior to planting soybeans or applied after planting (see preemergence). Preplant treatments should be incorporated within 7 days of application. Mechanical incorporation may not be necessary if adequate rainfall occurs. Rates are 1 to 3 pints of Prowl 4E per acre, although rates for combinations with Sencor or Lexone are lower than when the herbicide is used alone.

**Sencor or Lexone (metribuzin) plus Basalin, Prowl, Treflan, or Tolban** can be tank mixed and applied within 7 to 14 days of planting. Incorporate evenly into the top 2 inches of soil. The rate of Sencor or Lexone in these combinations is ½ to 1 pound of 50W, ½ to 1 pint of 4L, or ⅓ to ⅔ pound of 75DF. Use the normal rate, or slightly less, of the dinitroaniline herbicide (see labels).

**Vernam (vernolate)** controls annual grasses and pigweed. It sometimes provides fair control of annual morningglory, velvetleaf, and yellow nutsedge. Some soybean

injury may occur in the form of delayed emergence, stunting, and leaf crinkling. Vernam can be applied within 10 days prior to planting and should be incorporated immediately. The broadcast rate is 2½ to 3½ pints of Vernam 7E or 20 to 30 pounds of Vernam 10G per acre. Vernam plus Treflan is labeled at the rate of 1 pint of Treflan plus 2½ to 3 pints of Vernam 7E per acre. The combination will reduce the risk of soybean injury, but it may also decrease control of velvetleaf and yellow nutsedge. Other labeled combinations include Vernam plus Amiben, Basalin, or Tolban.

#### **Preplant or Preemergence Herbicides**

**Lasso (alachlor) or Dual (metolachlor)** can be applied to soybeans preplant incorporated or during the preemergence stage. If applied prior to planting, apply Dual anytime within the 2 weeks prior to planting and Lasso within 1 week of planting. If rainfall is limited, incorporation can improve performance and increase yellow nutsedge control. Soybeans are quite tolerant of Lasso or Dual. The first to second trifoliolate leaves often appear crinkled with a drawstring effect on the middle leaflet, but these symptoms should not cause concern.

Lasso or Dual controls annual grasses plus pigweed and can help control nutsedge (see section on specific weed problems). These herbicides can be combined with Lexone, Sencor, or Amiben (incorporated or preemergence) and with Lorox or Dyanap (preemergence only) to improve broadleaf weed control. Lasso can also be combined with Modown or Goal.

The rate for Lasso is 2 to 4 quarts Lasso 4E or 16 to 26 pounds of Lasso II 15G per acre. The rate for Dual 8E is 1½ to 3 pints per acre. Use the higher amount for the soil when incorporating. The rate for combinations is about 75 percent of that for the herbicide used alone (see labels).

**Amiben (chloramben)** can be applied alone or with Treflan or Dual within a few days prior to planting. It can also be tank mixed with Treflan plus Sencor or Lexone as a preplant incorporated treatment. Amiben can be applied preemergence alone or with Dual, Lasso, Surflan, or Prowl to improve grass control, or with Lorox, Lexone, or Sencor. If it does not rain within 3 to 5 days of preemergence application, you should rotary hoe.

Amiben can control many weeds in soybeans, but do not expect control of cocklebur or annual morningglory. Control of velvetleaf and jimsonweed is often erratic, especially at lower rates or with low rainfall. Amiben occasionally injures soybeans, but damage is not usually severe. Injured plants may be stunted and have abnormal, shortened roots.

The rate is 4 to 6 quarts Amiben 2S or 20 to 30 pounds of Amiben 10G per acre. The rate in most combinations is 3 to 4 quarts Amiben 2S per acre. Amiben is best suited to soils with over 2.5 percent organic matter.

**Sencor or Lexone (metribuzin)** can be applied anytime during the 1 to 2 weeks prior to planting and in-

corporated with Basalin, Dual, Lasso, Prowl, Treflan, or Tolban. Incorporation should distribute the herbicide evenly in the top 2 inches of soil. It can be applied pre-emergence by itself or with Amiben, Dual, Lasso, Prowl, or Surflan.

Sencor or Lexone can control many annual broadleaf weeds except annual morningglory. Control of giant ragweed, jimsonweed, and cocklebur is often marginal at the reduced rates necessary to minimize soybean injury.

One symptom of soybean injury is yellowing (chlorosis) of the lower leaves at about the first trifoliolate stage or later; it may be followed by browning of leaves and death of plants depending upon the severity of the injury. Seedling diseases, weather stress, and atrazine carryover may increase the possibility of soybean injury. Injury may be greater on soils with pH over 7.5. Accurate, uniform application and incorporation are essential.

Adjust rates accurately according to soil conditions. *Do not apply to very sandy soil.* Combinations allow for reduced rates and thus reduce risk of soybean injury. The combination rate of Sencor or Lexone is ½ to 1 pound of 50W, ½ to 1 pint of 4L, or ⅓ to ⅔ pound of 75DF. You can use the higher amount when you apply this treatment during the preemergence stage, either alone or sequentially after application of a preplant herbicide. The higher amounts can improve broadleaf weed control, particularly of cocklebur, but they also increase the risk of soybean injury.

**Modown (Bifenox) or Goal (oxyfluorfen)** primarily controls broadleaf weeds such as pigweed, lambsquarters, and smartweed with some control of jimsonweed and velvetleaf. Combinations with grass herbicides will improve grass control.

Goal or Modown can be tank-mixed for preplant incorporation with Treflan or for preemergence treatment with Lasso. For preplant incorporation, Modown can also be mixed with Lasso, and Goal can be mixed with Basalin or Tolban. Preplant incorporation treatments should be applied within 2 or 3 days of planting. Incorporation should evenly place the herbicides into the top 1 to 2 inches of soil. Preemergence treatments should be applied within a few days after planting. Do not apply Goal or Modown after the soybeans begin to emerge.

Soybeans may show stunting from Modown or Goal, especially from preemergence use. This injury may be apparent if splashing rains occur shortly after emergence, or when cold, wet soil conditions occur during the early growth stages. Injury symptoms are leaf cupping and crinkling on the first few leaves. Soybeans usually recover sufficiently from this early injury to prevent yields from being affected.

Modown rates in combinations with herbicides for grass control are 2½ to 4 pints 4F or 1½ to 2½ pounds 80W per acre. The rate of Goal 2E is 1 to 1½ pints per acre for preemergence use with Lasso, or 1½ to 2 pints per acre for incorporation with Treflan, Basalin, or Tolban. Goal is also registered with Paraquat and Lasso

for no-till soybeans, and this use will probably be the primary one for Goal in 1982.

**Furloe Chloro IPC (chlorpropham)** can be preplant incorporated with Treflan, Tolban, or Vernam; or it can be applied preemergence by itself or with Lasso to improve smartweed control. Preplant application should be done within a few days of planting soybeans, and incorporation should distribute the herbicide evenly in the top 1 to 2 inches of soil. The rate in sequential or tank mix combinations is 2 to 3 quarts of Furloe 4E per acre. Furloe 20G is used preemergence at 10 to 15 pounds per acre.

#### **Preemergence Herbicides**

**Lorox (linuron)** is best suited to silt loam soils that contain 1 to 3 percent organic matter. *Do not apply to very sandy soils.* Lorox controls broadleaf weeds better than grass weeds. It does not control annual morning-glory, and control of cocklebur and jimsonweed is variable. Accurate and uniform application, and proper rate selection are necessary to minimize the risk of crop injury. Tank-mix combinations allow the use of a reduced rate of Lorox to decrease the risk of soybean injury, but may also decrease the degree of weed control.

Lorox is registered in tank-mix combinations with Amiben, Lasso, Dual, Prowl, or Surflan to improve grass control. The rate of Lorox in these combinations is 1 to 1½ pounds of Lorox 50W or ½ to ¾ pints of Lorox 4L on silt loam soils with less than 3 percent organic matter.

**Surflan (oryzalin)** can control annual grasses, pigweed, and lambsquarters if there is adequate rainfall. You should rotary hoe to control emerging weeds if adequate rain does not fall within 7 days after application. Do not use on soils of more than 5 percent organic matter. The rate is 1 to 2 pounds per acre of Surflan 75W (¾ to 1½ quarts 4L) used alone or ⅓ to 1⅓ pounds of Surflan 75W in combinations. Surflan can be tank mixed with Amiben, Lorox, Lexone, Sencor, Dyanap, or Klean-Krop to improve broadleaf weed control.

Prowl can be applied preemergence in combination with Amiben, Lexone, Lorox, or Sencor. When applied to the soil surface, Prowl may cause stem callousing, which can lead to soybean lodging and yield reduction. (See preplant section for more information.)

**Dyanap (dinoseb plus naptalam)** can be applied to soybeans from the time they are planted until the unifoliate leaves of the seedling unfold and expose the growing point. A tank mix of Dyanap plus Lasso, Dual, or Surflan is registered to improve grass control. Anrack and Klean-Krop are other trade names for dinoseb plus naptalam. However, they are not registered in combination with Lasso or for postemergence application. They are registered for preemergence use with Surflan.

#### **Postemergence Herbicides**

In the past, most farmers have placed primary emphasis on controlling weeds early with preplant or preemer-

gence applications, and have considered postemergence applications as a backup measure when control from earlier treatments was not adequate. Research suggests, however, that soybean yields will probably not be reduced if weeds are controlled within 3 to 4 weeks after planting. The trend toward reduced tillage could encourage greater emphasis on postemergence treatments.

Postemergence herbicides are most effective when their use is part of a planned program, and when they are applied while the weeds are young and tender. They should not be considered simply an emergency treatment. It is especially important to use timely treatments when using postemergence herbicides in narrow-row soybeans. Postemergence herbicides are often the best choice for controlling certain problem weeds such as cocklebur, annual morningglory, and volunteer corn.

Most of the currently available postemergence herbicides for soybeans do not give adequate control of annual grasses such as giant foxtail, and should be used in sequence with preplant incorporated or preemergence herbicides that control annual grasses.

Soybeans may be injured by some postemergence herbicides. If there is an adequate height difference between soybeans and weeds, the amount of soybean injury can be decreased by directing some herbicides toward the weeds and minimizing contact with the soybeans.

**Premerge (dinoseb)** can be applied in the early post-emergence period when soybeans are still in the seedling stage before first leaves open to expose the terminal bud. To control emerged weeds such as cocklebur, morning-glory, and jimsonweed, use 3 quarts per acre if the expected air temperature is below 75° F., and 2 quarts if it is from 75 to 95° F. Do not apply above 95° F. For residual control, Premerge can be tank-mixed with Amiben or Lasso. *Caution: Premerge is very toxic to man and animals.*

**Amiben (chloramben)** can be applied at 5 to 6 quarts per acre when soybeans are in the cracking to second trifoliate stage of growth. This treatment may control or suppress velvetleaf or smartweed that is less than 4 inches tall.

**Basagran (bentazon)** can control many broadleaf weeds, such as cocklebur, jimsonweed, and velvetleaf. It is weak on pigweed, lambsquarters, and annual morning-glory. It can provide some control of yellow nutsedge and Canada thistle but not of annual grasses.

The suggested rate for Basagran is ¾ to 1 quart per acre, depending on weed size and species. Application should be done when weeds are small (2-3 inches) and actively growing. These conditions usually exist when the soybeans are in the unifoliate to second trifoliate stage. Spraying during warm sunny weather can also improve performance. Use a minimum of 20 gallons of water per acre in order to get complete weed coverage. Adding a surfactant or crop-oil concentrate to Basagran may increase performance, particularly on yellow nutsedge,

velvetleaf, and morningglory, but may cause some soybean injury.

**Blazer (acifluorfen)** is a postemergence herbicide used to control broadleaf weeds in soybeans. The rate is 2 pints of Blazer 2S when broadleaf weeds are at the 2- to 4-leaf stage and growing actively. Blazer controls annual morningglory, black nightshade, and pigweed better than Basagran, but Basagran is better on cocklebur and velvetleaf. Under ideal conditions, Blazer may also help control very small, escaped annual grasses. Blazer is primarily a contact herbicide. Suggested spray volumes are 20 to 40 gallons per acre with a spray pressure of 40 pounds per square inch. Surfactants or crop oils are not recommended with Blazer. Do not spray if rain is anticipated within 6 hours.

**Dyanap (dinoseb plus naptalam)** can be applied to soybeans after the second trifoliate leaf opens until beans become 20 inches tall. Two to 3 quarts per acre is recommended for control of cocklebur, jimsonweed, smartweed, and annual morningglory less than 3 inches tall. Four quarts per acre may control cocklebur and jimsonweed taller than 3 inches. A split application of 2 quarts at the second trifoliate stage followed by 2 quarts 10 to 14 days later is recommended for severe weed infestations.

Best results are obtained by using high pressure (40 to 60 pounds per square inch) and 8 to 10 gallons of water per acre. Although leaf burn can occur, the crop usually recovers within 2 to 3 weeks with little or no yield loss. Do not apply Dyanap to wet soybean foliage.

**Hoelon (dichlofop)** may control many annual grass weeds and volunteer corn. Annual grass weeds should be in the 1- to 4-leaf stage of growth, volunteer corn should be less than 10 inches high, and soybeans should be at the fifth trifoliate stage or less. The rate is 2 to 3½ pints of Hoelon 3E per acre in at least 20 gallons of water. Because thorough coverage of the foliage is essential, a minimum pressure of 20 pounds per square inch is recommended. Do not use Hoelon in a tank mixture with other postemergence herbicides. *Hoelon is a restricted-use herbicide.*

**Vistar (mefluidide)** may be used for postemergence control of johnsongrass in soybeans south of Highway I-70 in Illinois. Vistar may also suppress some other grasses such as volunteer corn and shattercane. Vistar 2S is used at the rate of 1 pint per acre after the second trifoliate stage of soybeans, and when johnsongrass is less than 15 inches tall. If new growth or regrowth of johnsongrass occurs, a second application may be necessary 3 to 4 weeks after the first application, but no later than 60 days prior to harvest. A nonionic surfactant such as Citowett or Surfactant WK should be used at the rate of 1 to 2 pints per 100 gallons of spray solution.

Johnsongrass is not immediately killed by Vistar, and usually about 10 days will elapse before the leaves turn brown. Maximum results will be seen in about 3 weeks. Soybeans may also show some injury from Vistar, as indicated by leaf crinkling or slight growth suppression.

### **Directed Postemergence Herbicides**

**Roundup (glyphosate)** can be applied through several types of selective applicators — recirculating sprayers, wipers, or rope wicks. This application is particularly useful for control of volunteer corn, shattercane, and johnsongrass. Roundup may also suppress hemp dogbane and common milkweed. Weeds should be a minimum of 6 inches above the soybeans. Avoid contact with the crop. Equipment should be adjusted so that the lowest spray stream or wiper contact is at least 2 inches above the soybeans. For calibration of equipment, refer to the Roundup label. If you use a recirculating sprayer, apply 4 quarts of Roundup in 20 gallons of water to suppress perennial broadleaf weeds. To control perennial grass and annual weeds, use 2 to 3 quarts of Roundup in 20 gallons of water. For wiper or roller type applicators, mix 1 to 2 gallons of Roundup in 20 gallons of water. Use the higher amount for heavy weed infestations, perennial weeds, and annual broadleaves. For rope wick applicators, mix 1 gallon of Roundup in 2 gallons of water.

**Alanap-L (naptalam) plus 2,4-DB** is labeled for use 7 to 10 days before soybeans bloom through mid-bloom. Rates are 2 to 3 quarts of Alanap-L plus 3 to 4 ounces of Butoxone SB or Butyrac 200 per acre. Ground application should be at 10 to 20 gallons of spray volume per acre, using hollow cone nozzles positioned 18 to 24 inches above the soybeans or weeds. Maintain spray pressure at 40 to 50 psi.

**Butoxone SB and Butyrac 200 (2,4-DB)** are used for directed postemergence control of cocklebur in soybeans. 2,4-DB also may give some control of annual morningglory and giant ragweed. Consider 2,4-DB for emergency control of cocklebur when potential benefit from weed control is more significant than risk of soybean injury. Injury symptoms include leaf wilting, stem curvature, and cracking of stems. 2,4-DB alone or in combination with Lorox can be directed when soybeans are at least 8 inches high and cockleburs are less than 4 inches high. Do not spray on more than the lower third of the soybean plant.

**Lorox plus 2,4-DB, or Paraquat alone** are also cleared for directed postemergence treatment in soybeans. Soybeans must be at least 8 inches tall and weeds not over 2 inches tall. Nozzles must be adjusted accurately to spray only the lower one-third of the soybean plant or serious soybean injury can occur. Read the labels for the correct rates and precautions.

**Goal (oxyfluorfen)** may be used as a directed postemergence treatment for control of cocklebur, prickly sida, and annual morningglory. Soybeans should be at least 8 inches high and weeds not over 4 inches high. Adjust nozzles to minimize spray contact with the soybeans.

### **Paraquat Harvest Aid**

Paraquat is registered for drying weeds in soybeans just before harvest. For indeterminate varieties (most Illinois

varieties), apply when 65 percent of the seed pods have reached a mature brown color or when seed moisture is 30 percent or less. For determinate varieties, apply when beans are fully developed, at least one-half of the leaves have dropped, and remaining leaves are turning yellow.

The rate is ½ to 1 pint of Paraquat per acre. The higher rate is for cocklebur. The total spray volume per acre is 2 to 5 gallons per acre for aerial application or 20 to 40 gallons for ground application. Add 1 quart of Ortho X-77 Spreader per 100 gallons of spray. Do not pasture livestock within 15 days of treatment, and remove livestock from treated fields at least 30 days before slaughter.

## No-Till and Double-Crop

Corn and soybeans are sometimes produced without seedbed preparation, either in last year's crop residue (no-till) or as a second crop after small grain harvest or forage removal (double-crop). The no-till concept of planting has greatly improved the probability of success of double-cropping by conserving soil, soil moisture, and time.

No-till herbicides must control both vegetation existing at planting and seedling weeds that germinate after planting. Existing vegetation may be a perennial grass sod, a legume or legume-grass sod, an annual cover crop, or weeds that emerge in the previous years' crop stubble before planting. If a cutting of forages such as alfalfa or clover is removed before no-till planting, control of sod may be poor. Labeled applications of 2,4-D, Roundup, or Banvel can improve control of broadleaf perennials when used in registered crops, such as corn or sorghum.

Several precautions should be observed in no-till cropping systems. Crop seed should be planted to the proper depth and adequately covered to avoid possible contact from herbicide sprays. (Several herbicide labels give planting depths necessary to avoid possible injury.) Pre-emergence applications of the herbicide treatment may give better weed control than preplant applications since the planting process may expose untreated soil containing viable weed seed. The total reliance on chemical weed control and large amounts of crop residue present under no-till cropping systems may require that the higher labeled herbicide rates be used to obtain acceptable weed control.

**Paraquat** (1 or 2 pints per acre) plus a *nonionic* surfactant, such as Ortho X-77, at ½ pint per 100 gallons of diluted spray is generally used to "knock down" existing foliage before crop emergence. Smartweed, giant ragweed, and fall panicum may not be controlled if they are over 10 to 12 inches high and if no rain occurs to "activate" the residual herbicides. Since Paraquat provides only contact action, a minimum of 40 gallons or more of spray per acre is suggested to insure adequate coverage of the foliage. *Paraquat is a restricted-use pesticide.*

**Roundup** (3 pints per acre) should be considered as an alternative treatment for control of the foliage prior

to crop emergence in situations where fall panicum, smartweed, or certain perennial weeds are a problem. Roundup can translocate to the roots to give better control of perennials. Use 20 to 40 gallons of spray volume per acre.

**Bronco** is a formulated mixture of glyphosate (Roundup) plus alachlor (Lasso). Application rates are 4 to 5 quarts per acre. Do not apply in liquid fertilizers.

### No-till Corn

Herbicides registered with Paraquat plus atrazine are Dual, Lasso, Princep, and Bladex. Dual plus Princep, atrazine plus Princep, and Bicep are also registered with Paraquat. These combinations give better control of annual grasses than atrazine or Bladex plus Paraquat.

Herbicides registered with Roundup plus atrazine or Princep are Dual and Lasso. Roundup is also registered with atrazine plus Princep, atrazine plus Princep plus Dual, Lasso plus Bladex, and Bicep for use in no-till corn. Bronco is registered for use with atrazine, Bladex, or Princep.

### No-till or Double Crop Soybeans

Preemergence herbicides registered in soybeans as tank mixes with Paraquat (1 to 2 pints per acre) plus Ortho X-77 surfactant are Lorox, Sencor, or Lexone alone or in combination with Lasso, Dual, or Surflan. Goal plus Lasso is also cleared with Paraquat. Registered tank mixes with Roundup are Lasso or Dual in combination with Lorox, Sencor, or Lexone. Bronco is registered with Lexone, Lorox, or Sencor.

## Herbicides for Sorghum

**Atrazine** may be used for weed control in sorghum (grain and forage types) or sorghum-sudan hybrids. Application may be made preplant, preemergence, or post-emergence. Plant seed at least 1 inch deep. Do not use preplant or preemergence on soils with less than 1 percent organic matter. Incorporated treatments may show injury if rainfall occurs prior to or shortly after sorghum emergence.

Injury may occur when sorghum is under stress from unusual soil or weather conditions or when rates are too high. The rate of application for preplant and preemergence is 2 to 3 pounds of atrazine 80W per acre. The postemergence rate is 2½ to 3¾ pounds 80W per acre. Rotational crop recommendations and weed control are the same as for atrazine used in corn. Failure to control fall panicum has been a major problem.

**Ramrod, Bexton, or Propachlor (propachlor)** may be used alone or in combination with atrazine, Milogard, Bladex, or Modown for sorghum. Propachlor will improve grass control, but rates must not be skimpy, especially on soils relatively low in organic matter. For specific rates, consult the product label.

**Dual (metolachlor)** or Dual plus atrazine (or Bicep)

can be used on sorghum seed that has had the Concep-seed treatment. These herbicides will improve grass control more than atrazine applied alone.

Milogard (propazine) has better sorghum tolerance than atrazine, but grass control is not as good. Only corn or sorghum may be planted in rotation within 12 months after treatment.

2,4-D may be applied postemergence for broadleaf control in 4- to 12-inch tall sorghum. Use drop nozzles if sorghum is more than 8 inches tall. Rates are similar to those for use in corn (see page 8).

Banvel can be applied postemergence until sorghum is 15 inches tall or 25 days after emergence. The rate is ½ pint per acre. Do not graze or feed treated forage or silage prior to the mature grain stage. Sorghum may be injured by Banvel.

## Specific Weed Problems

### Yellow Nutsedge

Yellow nutsedge is a perennial sedge with a triangular stem. It reproduces mainly by tubers. Regardless of the soil depth at which the tuber germinates, a basal bulb develops 1 to 2 inches under the soil surface. A complex system of rhizomes (underground stems) and tubers develops from this basal bulb. Yellow nutsedge tubers begin sprouting about May 1 in central Illinois. For the most effective control, soil-applied herbicides should be incorporated into the same soil layer in which this basal bulb is developing.

For soybeans, a delay in planting until late May allows time for two or three tillage operations to destroy many nutsedge sprouts. Tillage helps deplete food reserves in nutsedge tubers. Row cultivation is helpful. Preplant applications of Lasso, Dual, or Vernam will also help.

Lasso (alachlor) applied preplant incorporated at 3 to 4 quarts per acre (½ quart more than for surface-applied rates) often gives good control of nutsedge.

Dual (metolachlor) can be applied at 2 to 3 pints of 8E per acre to control nutsedge. Preplant treatment is preferred to treatment at the preemergence stage.

Vernam 7E (vernolate) applied preplant at 3½ pints per acre is also effective against yellow nutsedge. Immediate incorporation is necessary with Vernam.

Basagran (bentazon) is a postemergence treatment that can also help control nutsedge in soybeans. One quart per acre can be applied when nutsedge is 6 to 8 inches tall. A split application (two treatments) of Basagran has also been registered. Addition of a crop-oil concentrate to Basagran may improve performance.

For corn, preplant tillage before nutsedge sprouts is of little help in control. Timely cultivation gives some control, but a program of herbicides plus cultivation has provided the most effective control of nutsedge.

Several preplant treatments are available. Eradicane

(EPTC) or Sutan+ (butylate) at 4¾ to 7½ pints per acre are effective for control of yellow nutsedge in corn. They must be incorporated immediately. Lasso or Dual applied in corn as for soybeans can also be quite effective.

The combinations of Lasso, Dual, Sutan+, or Eradicane incorporated with atrazine may give better control of nutsedge while also controlling broadleaf weeds.

Atrazine or Bladex (cyanazine) is used as a post emergence spray to control emerged yellow nutsedge when it is small. Split applications of atrazine plus oil have been more effective than single applications. Basagran can be used in corn in a manner similar to that for soybeans. Lorox (linuron) directed postemergence spray has also given some control.

### Johnsongrass

Johnsongrass can reproduce both from seeds and by rhizomes. Both chemical and cultural methods are needed to control johnsongrass rhizomes.

Much of the rhizome growth occurs after the johnsongrass head begins to appear. Mowing, grazing, or cultivating to keep the grass less than 12 inches tall can reduce rhizome production significantly.

Control of johnsongrass can also be improved with tillage. Fall plowing and disking bring the rhizomes to the soil surface, where many of them are winter-killed. Disking also cuts the rhizomes into small pieces, making them more susceptible to chemical control.

Johnsongrass rhizomes can be controlled or suppressed using certain herbicides in various cropping programs. Several preplant incorporated herbicides can provide control of johnsongrass seedlings in soybeans or corn (see the table at the end of this article).

Treflan (trifluralin), Prowl (pendimethalin), or Basalin (fluchloralin) used in a 3-year soybean program has been fairly successful in controlling rhizome johnsongrass. They are used at 1½ to 2 times the normal rate each year for 2 years, and then either at the normal rate, or another suitable herbicide is used the third year before resuming a regular cropping sequence. Thorough preplant tillage and incorporation are necessary for satisfactory control. Be certain not to plant such crops as corn or sorghum following application of these herbicides at the higher rates.

Eradicane (EPTC) or Sutan+ (butylate) will suppress rhizome johnsongrass in corn when used at a rate of 7½ pints per acre as a preplant incorporated treatment. However, this increase in rate also increases the risk of corn injury.

Dalapon can be used to treat emerged johnsongrass before planting corn or soybeans. Apply 5 to 7 pounds per acre after the grass is 8 to 12 inches tall. Plow or disk after 3 days and then delay planting corn or soybeans at least 1 week. See the label for specific intervals.

Dalapon can also be used to control johnsongrass after wheat that is not double cropped or undersown with a



legume. A combination of mowing, timely dalapon application, and tillage has provided quite effective control of johnsongrass.

**Roundup (glyphosate)** can be used as a spot treatment to control johnsongrass in corn, soybeans, or sorghum. Apply 2 to 3 quarts when johnsongrass has reached the boot to head stage and is actively growing. Use of Roundup in wick or recovery-type sprayers is effective for control of johnsongrass in soybeans. (See section on directed postemergence herbicides for soybeans.)

Roundup may be applied in small grain stubble when johnsongrass is in the early head stage. Fall applications should be made before the first frost. At least 7 days should be allowed after treatment before tillage.

#### **Quackgrass**

Quackgrass is a perennial grass with shallow rhizomes. Most preemergence herbicides will not control it.

**Atrazine** is quite effective when used as a split application in corn. Apply 2½ pounds of atrazine 80W per acre in the fall or spring and plow 1 to 3 weeks later. Another 2½ pounds per acre should be applied as a pre-plant or preemergence treatment. Postemergence application is usually less effective. A single treatment with 3¾ to 5 pounds per acre can be applied either in the spring or fall 1 to 3 weeks before plowing, but the split application usually gives better control of annual weeds. If more than 3 pounds of atrazine is applied per acre, do not plant crops other than corn or sorghum the following year.

**Eradicane (EPTC)** can be used to suppress quackgrass in corn where more flexibility in cropping sequence is desired. A rate of 4¾ pints per acre of Eradicane 6.7E can be used on light infestations, while 7½ pints per acre is suggested for heavier infestations. There is some risk of corn injury, especially at the higher rate. A tank mix with atrazine should improve control.

**Dalapon** can be applied to quackgrass 4 to 6 inches tall in the spring at a rate of 8 pounds per acre. Plow after 4 days and delay planting corn for 4 to 5 weeks. Up to 15 pounds of dalapon per acre may be used in the fall.

**Roundup (glyphosate)** can be used for controlling quackgrass before planting either corn or soybeans. Apply

2 to 3 quarts per acre when quackgrass is 8 inches tall and actively growing (fall or spring). Delay tillage for 3 or more days after application.

#### **Canada Thistle**

Canada thistle is a perennial weed that has large food reserves in its root system. There are several varieties of Canada thistle. They differ not only in appearance but also in their susceptibility to herbicides.

**2,4-D** may give fairly good control of some strains. Rates will depend on where the thistle is growing. For example, higher rates can be used in grass pastures or in noncrop areas than can be used in corn. **Banvel** often is a little more effective than 2,4-D and may be used alone or in combination with 2,4-D.

**Atrazine and oil** applied postemergence has been fairly effective in controlling Canada thistle in corn. Make the application before thistles are 6 inches tall.

**Basagran (bentazon)** can be used for control of Canada thistle in soybeans or corn when the thistles are 8 to 12 inches tall. Apply ¾ to 1 quart per acre in a single application, or for better control make two applications of ¾ to 1 quart per acre each, 7 to 10 days apart.

**Roundup (glyphosate)** can be used at 2 to 3 quarts per acre when Canada thistle is at or beyond the early bud stage. Fall treatments must be applied before frost for best results. Allow 3 or more days after application before tillage.

**Amitrole or Amitrole-T** effectively controls Canada thistle, but can be used only in noncrop areas. **Tordon (picloram)** gives good control of Canada thistle, but soybeans and most other broadleaf plants are extremely sensitive to it. Use only on noncropland.

#### **Additional Information**

Not all herbicides and herbicide combinations available are mentioned in this publication. Some are relatively new and are still being tested. Some are not considered to be very well adapted to Illinois or are not used very extensively. For further information on field crop weed control, consult your county Extension adviser or write to the Department of Agronomy, N-305 Turner Hall, 1102 S. Goodwin Avenue, University of Illinois at Urbana-Champaign, Urbana, Illinois 61801.

## Relative Effectiveness of Herbicides on Major Weeds

This chart gives a general comparative rating. Under unfavorable conditions, some herbicides rated good or fair may give erratic or poor results. Under very favorable conditions, control may be better than indicated. Type of soil is also a very important factor to consider when selecting herbicides. Rate of herbicide used also will influence results. G = good, F = fair or variable, and P = poor.

	Grasses								Broadleaf Weeds									
	Crop tolerance	Foxtail	Barnyardgrass	Crabgrass	Fall panicum	Johnsongrass seedlings	Shattercane	Yellow nutsedge	Annual morningglory	Cocklebur	Jimsonweed	Lambsquarters	Nightshade, black	Pigweed	Ragweed, common	Ragweed, giant	Smartweed	Velvetleaf
<b>SOYBEANS</b>																		
<b>Preplant</b>																		
Treflan, Tolban, Prowl, Basalin	F-G	G	G	G	G	G	G	P	F-P	P	P	G	P	G	P	P	P-F	P
Sencor, Lexone + dinitroaniline	F	G	G	G	G	G	G	P	F	F	F-G	G	P	G	G	F	G	F-G
Vernam	F	G	G	G	G	G	G	F	F-P	P	P	F	P	G	P	P	P	F
<b>Preplant or Preemergence</b>																		
Amiben	F-G	G	F-G	F-G	F-G	F	F	P	P	P	P-F	G	F-G	G	F-G	F	F-G	F
Lasso, Dual	G	G	G	G	G	P-F	P-F	F-G	P	P	P	F	F-G	G	P-F	P	P-F	P
Lasso or Dual + Sencor or Lexone	F	G	G	G	G	P	P	F	P	F	F-G	G	F	G	G	F	G	F-G
Lasso or Dual + Lorox <sup>1</sup>	F	G	G	G	G	P	P	P-F	P	F	F	G	F-G	G	G	F	G	F-G
Lorox <sup>1</sup>	F	F	F	F	F	P	P	P	P	F	F	G	P-F	G	G	F	G	F-G
Modown, Goal	F	F	F	F	F	P	P	P	F-P	P	F	G	F	G	F	P	G	F
Sencor, Lexone <sup>1</sup>	F	F	F	F	F	P	P	P-F	P	F	F-G	G	P	G	G	F	G	F-G
<b>Postemergence</b>																		
Basagran	F-G	P	P	P	P	P	P	F	P-F	G	G	F	P	F	F	F	G	F-G
Blazer	F	P-F	P	P-F	P	P	P	P	F-G	F	G	F	F-G	F-G	F	F	G	P
Dyanap	F	P	P	P	P	P	P	P	F	G	G	F-G	P-F	F-G	F	F	P	P-F
2,4-DB	P-F	P	P	P	P	P	P	P	F-G	G	P-F	F	P	F	F	F	P	P
Hoelon	G	F-G	F	F-P	F	P	P	P	P	P	P	P	P	P	P	P	P	P
<b>CORN</b>																		
<b>Preplant</b>																		
Sutan+, Eradicane	F-G	G	G	G	G	F-G	F-G	F-G	P	P	P	P-F	F	G	P	P	P	F
Sutan+ or Eradicane + atrazine, Bladex	F-G	G	G	G	G	F-G	F-G	F-G	F-G	F-G	G	G	G	G	G	F	G	F-G
Princep + atrazine	G	F-G	F-G	F	F	P	P-F	P	F-G	F-G	G	G	G	G	G	G	G	F
<b>Preplant or Preemergence</b>																		
Atrazine	G	F-G	F	P	P	P	P	F	G	F-G	G	G	G	G	G	G	G	F-G
Banvel + Lasso or Dual	F-G	G	G	G	G	P	P	F	P-F	F	F-G	G	G	G	G	F	G	F
Bladex	F-G	F-G	F-G	F-G	G	P	P	P	F	F-G	G	G	G	F	G	F-G	G	F
Bladex + atrazine	F-G	F-G	F	F	F-G	P	P	P	F-G	F-G	G	G	G	G	G	F-G	G	F-G
Lasso, Dual	F-G	G	G	G	G	P-F	P-F	F-G	P	P	P	F	F	G	P-F	P	P-F	P
Lasso or Dual + atrazine or Bladex	F-G	G	G	G	G	P	P	F-G	F-G	F	G	G	G	G	G	F	G	F
Prowl + atrazine or Bladex <sup>1</sup>	F-G	G	G	G	G	F	F	P	F-G	F	G	G	G	G	G	F	G	F-G
Propachlor + atrazine or Bladex <sup>1</sup>	G	G	G	F-G	F	P	P	P-F	F-G	F	G	G	G	G	G	F	G	F
Ramrod, Bexton, Propachlor <sup>1</sup>	G	G	F	F-G	F	P	P	P-F	P	P	P	F	P	G	P	P	P	P
<b>Postemergence</b>																		
Atrazine + oil	F-G	F-G	G	P	P	P	P	F	G	G	G	G	G	G	G	F	G	F-G
Banvel	G	P	P	P	P	P	P	P	G	G	G	G	G	G	G	G	G	F
Basagran	G	P	P	P	P	P	P	F	P-F	G	G	F	P	F	F	F	G	F-G
Bladex	F-G	G	G	F	F-G	P	P	F	F	F-G	G	F	G	F-G	G	F	G	F
2,4-D	F-G	P	P	P	P	P	P	P	G	G	F	G	F	G	G	G	P-F	F-G

<sup>1</sup> Preemergence only

