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Weed Management in Texas Corn

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GENERAL PRACTICES

Weeds compete with corn for moisture, light, and nutrients. Thus, effective weed management is critical for maintaining yield potential. In addition to yield losses, weed infestations can complicate harvest operations, reduce grain quality, and harbor harmful insects and diseases. A vigorous corn crop can quite easily out-compete weeds; however yield losses due to weed infestations do occur frequently. A combination of preventative practices, cultural practices, and timely chemical control with herbicides is needed as part of an integrated weed management system.

PREVENTATIVE WEED CONTROL

Quality Seed

Make sure to plant weed-free seed to prevent in-row infestations and the introduction of new weed species. This can be accomplished by either cleaning seed prior to planting, or by purchasing certified seed that has been inspected.

Other Preventative Control Methods

After harvesting each field, thoroughly clean equipment before moving to the next field to prevent spread of weed seed. When possible, consider harvesting the cleanest fields first before moving to fields with greater weed infestations.

CULTURAL PRACTICES

There are several cultural practices that can have a significant impact on weed populations when properly implemented. Practices that break up the life cycle of weed species and those that encourage vigorous crop growth and a dense stand will help the crop gain a competitive advantage over weeds.

Crop Rotation

Crop rotation is a vital component for effective weed management. In mono-cropped systems (continuous corn production), weeds with the same life cycle as the crop will gradually increase in abundance. Weeds emerging with the crop that have a similar life cycle are typically the most problematic. By rotating to a cool-season crop such as wheat, the life cycle of these weeds can be disrupted. Likewise, the life cycle of troublesome weeds of cool-season crops can be broken up by rotation back to a warm-season crop such as corn. Additionally, rotation from a grass crop to a broadleaf crop such as cotton or soybean is very beneficial. Troublesome grass weeds in corn can be easily controlled in a broadleaf crop. Likewise difficult-to-control broadleaf weeds in cotton or soybean are easily controlled in a grass crop. With regular rotation, the abundance of weed seed in the soil is gradually depleted, resulting in decreased weed competition.

Fallow Weed Management

Proper weed management in the fallow periods prior to corn planting and after corn harvest is vital for reducing the production of weed seeds, conserving soil moisture, and disrupting insect and disease pests. Ahead of planting, herbicides, tillage, or a combination of the two can be used to control weeds on fallow ground. After harvest, effective control of weeds and volunteer corn is critical for preserving nutrients and moisture for the next crop, as well as breaking insect and disease cycles by controlling volunteer corn. As before, both tillage and chemical weed control may be appropriate during this period.

Seeding

Planting corn at the right time under optimal conditions allows for stronger, more competitive growth by avoiding unfavorable environmental conditions. Proper seeding rates are also important for improving weed management. Fields planted at too low a population will offer a greater opportunity for weed infestations. Placing corn seed at the proper depth results in a uniform stand, which also confers a greater competitive advantage to the crop.

Row Spacing

When moisture is adequate, narrower row spacings result in faster canopy coverage and shading of middles. This will provide greater suppression of weed growth. Ultimately, row spacing should be adjusted to the availability of resources to ensure maximum crop growth and production.

Row Direction

Row direction has been observed to impact weed emergence and growth. When rows are arranged in a north-south direction, there is typically greater shading of middles than if rows are arranged east-west. Thus, if the slope of the field allows, north-south rows would be preferred. Typically, row direction is dictated by other management factors, such as available row length, slope, and equipment. Thus, importance should be placed on other measures.

Fertilization

Proper soil fertility is vital for producing a highly competitive crop. Apply fertilizer at the rate needed based on soil testing. Excess nutrients, especially nitrogen, will often result in increased weed growth. Banding of fertilizer applications will help limit weed access to nutrients while enhancing availability to the crop.

CHEMICAL CONTROL

Before a herbicide program is implemented there are several key considerations. First, weeds must be correctly identified. Also, the weed size and the density of the infestation must be considered. Next, the growth stage of the crop must be considered. Many herbicides can only be applied at specific crop growth stages to avoid crop injury. The persistence of the herbicide must also be considered as some herbicides remain active in the soil for considerable periods of time, and may negatively affect rotational crops planted after corn. The same concept applies when rotating to corn from other crop species. These crop rotation intervals can be found in Table 5. Lastly, consider the cost of treatment and the potential benefits before control measures are taken.

Weed identification and field scouting

Effective weed control begins with identification of weed species in given field. Weed surveys each spring will help producers to keep records of weed populations and infestation levels. In-season monitoring should be continued periodically to determine whether postemergence herbicides and pre-harvest herbicides are required, and to evaluate the efficacy of applied herbicides.

Timing of herbicide applications

It is easier to control smaller weed seedlings than larger weeds. Many postemergence herbicide product labels will specify maximum weed sizes at application for optimal control. Herbicides generally work best when the weeds are actively growing. Stressed weeds may survive herbicide applications. Understanding corn growth stages is important when selecting herbicides, as the proper growth stage for application is often outlined on the product label. Applying herbicides at the wrong stage of growth can lead to crop damage resulting in yield loss.

Incorporation of residual herbicides

In order for soil-applied residual herbicides to be effective, they must first be incorporated or "activated." If this does not take place, the herbicide will simply sit on the soil surface (often degrading rapidly due to sunlight), and weeds will germinate and emerge safely from below. Rather, the herbicide must be present in the zone of the soil where weed seeds are germinating. Depending on the product, incorporation may be achieved through rainfall or mechanical tillage. Many residual herbicides can be incorporated by rainfall or irrigation, and it is the first rainfall or irrigation after application that determines the depth of these herbicides. The quantity of water received is critical for moving the herbicide deep enough in the soil. Under dryland conditions, if a significant rainfall (0.75 inch or more) is not predicted within 7 days of application, a mechanical incorporation may be necessary. Mechanical incorporation through shallow tillage (typically to a depth of 2 to 3 inches) is a highly effective method of incorporation. The uniformity of mechanical incorporation is important to avoid "streaking" of the herbicide, thus two tillage passes made in different directions are recommended. The depth of mechanical incorporation is also critical – the herbicide only needs to be mixed to the depth of germinating weed seeds. If incorporated too deeply, the herbicide becomes "diluted" in the soil and decreased weed control is likely to occur. For power-driven incorporation implements will typically place the herbicide as deep as the machine is running, while implements such as a tandem disk or field cultivator will often place the herbicide at approximately one half the depth of tillage.

Herbicide resistant weeds

Herbicide resistant weeds are naturally occurring biotypes of a species with the inherited ability to survive and reproduce following exposure to a herbicide that normally would control that weed species. With repeated use of the same herbicide or herbicides with the same mode of action, resistant weeds are allowed to flourish and increase in abundance. These resistant weeds pose a significant threat to corn production and threaten the long-term sustainability of chemical weed control.

Currently, there are 252 herbicide resistant weed species (146 dicots and 106 monocots) globally (Heep, 2017). Of which, herbicide resistant weeds identified in Texas include perennial ryegrass (ALS inhibitors), barnyardgrass (PSII inhibitor), Palmer Amaranth (PS II inhibitors and EPSP synthase inhibitors), kochia (ALS inhibitors), johnsongrass (ALS inhibitors), and tall or common waterhemp (EPSP synthase inhibitors). Of these herbicide resistant weed cases, the glyphosate resistant *Amaranthus spp.* (Palmer amaranth and common waterhemp) are the most troublesome in Texas corn due to the widespread reliance upon glyphosate for weed management. These weeds are capable of producing in excess of 500,000 seed per female and can spread rapidly throughout a region once established. What follows are a few key points to consider for managing these resistant weeds.

To combat the spread of herbicide resistant weeds:

1. Employ integrated weed management strategies. Use herbicides only when necessary, and combine them with mechanical, cultural, or biological methods.

2. When possible, tank mix herbicides with different mechanisms of action. If tank mixes are not an option, rotate herbicides with different mechanisms of action. The Weed Science Society of America (WSSA) has devised a numbering system for classifying herbicide mechanisms of action into groups. Often, you will find these group numbers on product labels. Table 1 lists commonly used herbicides labelled for corn and provides the mechanism of action and WSSA group number.

Table 1. Mechanism of action of herbicides labelled for corn

Mechanism of Action	WSSA Group #	Common Active Ingedients	Representative Product(s)
ALS inhibitors	2	nicosulfuron, primisulfuron, rimsulfuron	Accent, Beacon, Resolve
Microtubule assembly inhibitors	3	pendimethalin, trifluralin	Prowl H2O, Treflan
Synthetic auxins	4	2,4-D, dicamba, fluroxypyr	2,4-D, Clarity, Starane
Photosystem II inhibitors	5	atrazine, simazine	Atrazine, Princep
	6	bentazon	Basagran
	7	diuron, linuron	Direx, Linex
EPSPS synthase inhibitors	9	glyphosate	Glyphosate (Roundup)
Glutamine synthetase inhibitors	10	glufosinate	Liberty 280 SL
PPG oxidase inhibitors	14	carfentrazone, fluthiacet-methyl, flumioxazin	Aim, Cadet, Valor
VLCFA inhibitors	15	S-metolachlor, dimethenamid-P, pyroxasulfone	Dual II Magnum, Outlook, Zidua
Photosystem I inhibitors	22	paraquat	Gramoxone
Pigment synthesis inhibitors	27	isoxaflutole, mesotrione, tembotrione	Balance Flexx, Callisto, Laudis

3. If possible, rotate to crops that allow the use of additional herbicide mechanisms of action. This is one of the most significant components of effective weed management.

4. Apply herbicides at the proper rate, timing of application, and spray volume. Be sure to use the full labelled rate of a given herbicide and apply it at the proper stage of weed and crop growth. Many postemergence herbicides are only effective if applied to very small weeds. If applied too late, weed control failures can be expected. Spray coverage is also critical for many postemergence herbicides, especially those that do not translocate within the plant (paraquat, glufosinate). Make sure to apply these herbicides using the proper total spray volume and nozzle type.

5. Perform frequent and thorough scouting for herbicide resistant weeds after herbicides are applied. Weeds that survive following spraying may be the result of application errors and are not necessarily resistant weeds. Herbicide failure can be caused by poor spray coverage, incorrect application rate, wrong timing, adverse environmental conditions, and "washing-off" of post-emergence applications. If resistant weeds are suspected, it can be confirmed by collecting seeds of the suspected resistant weeds and having a legitimate screening trial conducted on them to determine resistance. A few "red flags" of herbicide resistant weeds are: (1) if the same herbicide has been repeatedly applied in the same field, (2) the same weed species are repeatedly found surviving in the same location of the field, and (3) if dead (susceptible) plants can be found at the same location as the surviving weeds and these dead plants were at the same stage of growth at application.

PREPLANT BURNDOWN

A key component to effective weed management is to start with a clean field. This can be achieved by normal tillage operations and herbicide incorporations in conventionally tilled fields, or through the use of preplant burndown herbicides. Many herbicide options are available for controlling emerged weeds prior to planting as well as providing residual control of weeds until planting. Always be aware of plant back (crop rotation) restrictions to avoid crop damage. Refer to Table 2 for current recommendations for preplant burndown herbicides.

WEED MANAGEMENT AT PLANTING

Often, the most competitive weeds are those that emerge before or at the same time as the crop. These early-season weeds are very effective at competing for the same consumable resources such as water, nutrients, and sunlight that the corn seedling needs for healthy growth. If these weeds are not controlled, significant yield losses can be expected. With effective early season weed control, the yield potential of the crop is protected. Thus, it is important to apply residual herbicides (herbicides with soil activity) just prior to, or at planting. These herbicides will control weeds before they emerge, reducing the need for postemergence herbicides later in the season. It is important to note that rainfall, irrigation, or mechanical incorporation is needed with these residual herbicides to move them into the soil and activate them. Refer to Table 3 for recommendations for preplant and preemergence herbicides.

POSTEMERGENCE WEED CONTROL

Weeds that emerge during the season must be controlled either by cultivation or chemical means. Several herbicide options exist for postemergence (POST) weed control. When applying POST herbicides, it is vital to apply them at the proper timing, as many POST herbicides will only be effective if applied to very small weeds. This is especially true for the pigweeds or carelessweeds. In addition to POST herbicides, there are many herbicides available for over-the-top or directed spray applications that will provide residual control of weeds. Post-directed applications take advantage of the effectiveness of a particular herbicide on weeds that might be injurious to the crop. Ideally, POST herbicides will be

applied in a tank mix with a residual partner to control emerged weeds as well as to provide extended residual control. Refer to Table 4 for current recommendations for postemergence herbicides.

POST-HARVEST WEED MANAGEMENT

After harvest, there can be a substantial amount of time left for weed growth and development before temperatures drop to a level unfavorable for warm season weed growth, particularly in south Texas. Thus, weed control strategies must be implemented to prevent the production of additional weed seed that will become problems during the next season. In conventionally tilled fields, tillage operations provide good control of emerged annual weeds; however this disturbance also brings new seeds up to the soil surface. In the absence of tillage, herbicides must be used for weed control. Similar to chemical weed management strategies during the growing season, herbicide programs after harvest should include both postemergence and preemergence herbicides to control weeds already present and provide residual weed control later into the year. In addition, the post-harvest period provides an excellent opportunity to reduce populations of perennial weeds that might be present at this time. Application of postemergence systemic herbicides at this time can greatly enhance translocation of the herbicide to the root system of perennial plants, improving chances for their elimination. When choosing a residual herbicide to apply after harvest, pay close attention to any plant-back restrictions on the product label.

Table 2. Preplant burndown herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
2,4-D products *2,4-D*	1.0-2.0 pt (4 lb/gal product)	cocklebur, kochia, lambsquarters, common and ivyleaf morningglory, pigweed spp., purslane, giant ragweed, Russian thistle, sunflower, velvetleaf	4	Postemergence to small weeds.	Delay planting at least 7 days after applying 1.0 pt, or 14 days after applying 2.0 pt. Include NIS at 0.25% v/v.
Aim EC *carfentrazone-ethyl*	2.0 fl oz	lambsquarters, ivyleaf, entireleaf, and pitted morningglory, pigweed spp., velvetleaf, waterhemp, cocklebur, hophornbeam copperleaf, kochia, Russian thistle, Palmer amaranth, field bindweed, dayflower	14	Apply no later than one day after planting.	Include NIS at a rate of 0.25% v/v.
Axxe *ammonium nonanoate*	rates expressed in % v/v, see label	cocklebur, lambsquarters, marestail, annual morningglory, smooth and redroot pigweed, velvetleaf, large crabgrass	N/A	Postemergence to small weeds.	Nonselective contact herbicide, a total spray volume of 50 GPA is recommended.
Cadet *fluthiacet-methy*	0.4-0.9 fl oz	spreading dayflower, kochia, lambsquarters, annual morningglory, redroot and smooth pigweed, velvetleaf, waterhemp	14	Postemergence to small weeds.	Include NIS at 0.25% v/v, COC at up to 2.5% v/v, or a silicone-based surfactant at 0.25 % v/v. Use a minimum of 15 GPA for ground applications.
Clarity *dicamba*	0.5-1.0 pt, depending upon soil texture and organic matter	Palmer amaranth, cocklebur, hophornbeam copperleaf, kochia, lambsquarters, ivyleaf and tall morningglory, pigweeds, purslane, giant ragweed, sunflower, velvetleaf	4	Postemergence to small, actively growing broadleaf weeds.	The addition of NIS at 0.25% v/v, COC at 1 qt/A, UAN at 2-4 qt/A, or AMS at 2.5 lb/A will help improve weed control.
DiFlexx DUO *dicamba + tembotrione*	32-40 fl oz	Palmer amaranth, cocklebur, hophornbeam copperleaf, giant ragweed	4, 27	Postemergence to labeled weeds less than 6 inches in height.	Include MSO or COC at 1% v/v and either UAN at 1.5 qt/A or AMS at 8.5-17 lb/100 gal for burndown applications.
ETX *pyraflufen-ethyl*	0.3-1.25 fl oz	Palmer amaranth, cocklebur, cutleaf eveningprimrose, kochia, lambsquarters, morningglory spp., pigweed spp., purslane, giant ragweed, smellmelon, sunflower, Russian thistle, velvetleaf, waterhemp	14	Postemergence to weeds less than 4 inches in height.	Include COC at 1-2% v/v.
Firstshot SG *thifensulfuron-methyl + tribenuron-methyl*	0.5-0.8 oz	lambsquarters, sunflower, prostrate and redroot pigweed, many winter annual broadleaf weeds	2	Postemergence to small, actively growing weeds.	Include COC or MSO at 1% v/v, or NIS at 0.25% v/v. UAN at 2 qt/A or AMS at 2 lb/A may also be added.
Glyphosate products *glyphosate*	varied, refer to individual product label	many annual and perennial grass and broadleaf weeds	9	Postemergence to labeled weeds, refer to label for weed size restrictions.	Include 8.5-17 lb/A AMS.

Table 2. Preplant burndown herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Gramoxone SL *paraquat*	2.0-4.0 pt, depending upon weed size	Many annual grass and broadleaf weeds	22	Postemergence to labeled weeds.	Include NIS at 0.25 % v/v or COC at 1% v/v.
Hornet WDG *clopyralid + flumetsulam*	2.0-5.0 oz	many broadleaf weeds, dependent upon rate applied	2, 4	Postemergence to small broadleaf weeds.	Burndown applications should include COC at 1.0% v/v.
Kochiavore *2,4-D + bromoxynil + fluroxypyr*	1.0-1.5 pt	cocklebur, devil's claw, lambsquarters, morningglory, pigweed spp., sunflower, Russian thistle, velvetleaf, **suppression of kochia, field bindweed**	4,6	Postemergence to weeds, minimum of 7 days preplant.	Do not use on sandy soils.
Latigo *2,4-D + dicamba*	0.67-1.0 pt	cocklebur, marestail, kochia, lambsquarters, ivyleaf and tall morningglory, pigweed spp., sunflower, Russian thistle, velvetleaf	4	Postemergence to weeds, 7 days preplant if 0.5" rain or irrigation is received, otherwise 30 days preplant.	Make only one corn prelant application per season. Include NIS at 0.25% v/v and 0.5 gal/A liquid nitrogen fertilizer.
Liberty 280 SL *glufosinate-ammonium*	29-36 fl oz	Palmer amaranth, cocklebur, Devil's claw, kochia, lambsquarters, morningglory (entireleaf, ivyleaf, pitted, sharppod, smallflower, and tall), pigweed spp., purslane, smellmelon, sunflower, Russian thistle, velvetleaf, waterhemp, barnyardgrass, seedling Johnsongrass, junglerice, Texas panicum, shattercane, broadleaf signalgrass, sprangletop	10	Postemergence to weeds less than 3 inches tall.	Apply under warm temperatures, high humidity, and full sunlight for best results. Use AMS at 1.5 to 3.0 lb/A and apply in a minimum of 15 GPA.
Optill *saflufenacil + imazethapyr*	2.0 oz	Palmer amaranth, cocklebur, cutleaf eveningprimrose, marestail, kochia, lambsquarters, morningglory (entireleaf, ivyleaf, pitted, smallflower, and tall), pigweed spp., purslane, giant ragweed, sunflower, Russian thistle, waterhemp, seedling Johnsongrass, shattercane	2, 14	Postemergence to weeds.	**Use only with Clearfield corn hybrids.** Include MSO at 1% v/v with AMS at 8.5-17 lb/100 gal or UAN at 1.25-2.5 gal/100 gal. Do not use NIS or poor weed control will result.
Panther D *flumioxazin + 2,4-D*	1.0-2.0 pt	cocklebur, cutleaf eveningprimrose, lambsquarters, marestail, common and ivyleaf morningglory, pigweed spp., Russian thistle, sunflower	4,14	Postemergence to weeds, preplant intervals vary widely – check label.	Make only one preplant application per season. Will also provide residual control of many broadleaf species

Table 2. Preplant burndown herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Sharpen *saflufenacil*	1.0 fl oz	Palmer amaranth, cocklebur, cutleaf eveningprimrose, marestail, kochia, lambsquarters, morningglory (entireleaf, ivyleaf, palmleaf, pitted, and tall), false ragweed (Parthenium), pigweed spp., purslane, giant ragweed, sunflower, Russian thistle, velvetleaf, waterhemp	14	Postemergence to small weeds.	Include MSO at 1% v/v and AMS at 8.5 to 17 lb/100 gal or UAN at 1.25 to 2.5 gal/100 gal.
Starane NXT *fluroxypyr + bromoxynil*	14-21 fl oz	cocklebur, kochia, lambsquarters, sunflower	4, 6	Postemergence to weeds, from prior to planting to just prior to crop emergence.	The addition of NIS or COC is not required, but may help optimize herbicidal activity.
Valor SC *flumioxazin*	2.0-4.0 oz	depends on tank-mix partner	14	Postemergence to weeds less than 3 inches tall.	**Must be tank-mixed with approved burndown partners for postemergence weed control.** May be mixed with glyphosate, 2,4-D, dicamba, and others (see label). Apply in a minimum of 15 GPA.
Verdict *saflufenacil + dimethenamid-P*	5-10 fl oz	Palmer amaranth, cocklebur, cutleaf eveningprimrose, marestail, kochia, lambsquarters, morningglory (entireleaf, ivyleaf, pitted, and tall), parthenium (false ragweed), pigweeds, purslane, giant ragweed, sunflower, Russian thistle, velvetleaf, waterhemp	14, 15	Postemergence to weeds.	Higher rates may provide some residual activity. Include MSO at 1% v/v and AMS at 8.5-17 lb/100 gal or UAN at 1.25-2.5 gal/100 gal.

Table 3. Preplant and preemergence herbicides for residual weed control.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
AAtrex Nine-O *atrazine*	1.8-2.2 lb	lambsquarters, annual morningglory, pigweed, purslane	5	preplant incorporated, or preemergence	See statement on page 31 for guidelines for applying products containing atrazine.
Acuron *S-metolachlor + atrazine + mesotrione + bicyclopyrone*	2.5-3.0 qt, depending upon soil organic matter	barnyardgrass, crabgrass, broadleaf signalgrass, Palmer amaranth, cocklebur, devil's claw, marestail, kochia, lambsquarters, purslane, sunflower, Russian thistle, velvetleaf, waterhemp, **partial control of Texas panicum**	5, 15, 27	preplant surface or preemergence	May be applied up to 28 days prior to planting. May also be applied as a split application with 1/2 to 2/3 of the labeled rate applied preemergence, followed by 1/3 to ½ applied postemergence. See statement on page 31 for guidelines for applying products containing atrazine.
Acuron Flexi *S-metolachlor + mesotrione + bicyclopyrone*	2.0-2.25 qt, depending upon soil organic matter	barnyardgrass, crabgrass, broadleaf signalgrass, browntop panicum, Palmer amaranth, cocklebur, marestail, kochia, lambsquarters, pigweed spp., purslane, sunflower, Russian thistle, velvetleaf, waterhemp, **partial control of Texas panicum**	15, 27	preplant surface or preemergence	May be applied up to 28 days prior to planting. May also be applied as a split application with 1/2 to 2/3 of the labeled rate applied preemergence, followed by 1/3 to ½ applied postemergence.
Anthem *pyroxasulfone + fluthiacet-methyl*	5.0-13.0 fl oz, depending upon soil texture and organic matter	barnyardgrass, broadleaf signalgrass, crabgrass, Texas panicum, Palmer amaranth, pigweed (redroot, smooth, and tumble), purslane, waterhemp	14, 15	preplant surface, preplant incorporated, or preemergence	Provides limited control of some emerged weeds when appropriate adjuvants are included, see label for details.
Armezon PRO *topramezone + dimethenamid-P*	14-24 fl oz, depending upon soil texture and organic matter	Palmer amaranth, pigweed spp., purslane, waterhemp, barnyardgrass, crabgrass, rice flatsedge, yellow nutsedge	15, 27	preemergence	Do not use on sand-texture soil with less than 3% organic matter where depth to groundwater is 30 feet or less.
Atrazine 4L *atrazine*	3.2-4.0 pt	annual morningglory, kochia, lambsquarters, pigweed, purslane, velvetleaf	5	preplant incorporated or preemergence	See statement on page 31 for guidelines for applying products containing atrazine.
Axiom DF *flufenacet + metribuzin*	8-23 oz, depending upon soil texture and organic matter	barnyardgrass, crabgrass, browntop panicum, broadleaf signalgrass, lambsquarters, pigweed spp., purslane, waterhemp	5, 15	preplant surface, preplant incorporated, or preemergence	For preplant incorporated applications, mix into the 1 to 2 inches of soil.

Table 3 continued. Preplant and preemergence herbicides for residual weed control.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Balance Flexx *Isoxaflutole*	3.0-6.0 fl oz, depending upon soil texture and organic matter	Palmer amaranth, kochia, lambsquarters, marestail, pigweed spp., Russian thistle, sunflower, velvetleaf, waterhemp	27	preplant surface, preplant incorporated, or preemergence	If emerged weeds are present at application, include COC or MSO for control of weeds smaller than 3" tall.
Balance Pro *isoxaflutole*	1.5-3.0 fl oz, depending upon soil texture and organic matter	Palmer amaranth, kochia, lambsquarters, marestail, pigweed spp., Russian thistle, sunflower, velvetleaf, waterhemp	27	preplant surface, preplant incorporated, or preemergence	If emerged weeds are present at application, include COC or MSO for control of weeds smaller than 3" tall.
Bicep II Magnum *S-metolachlor + atrazine*	1.3-2.58 qt, depending upon soil texture and organic matter	barnyardgrass, browntop panicum, crabgrass, broadleaf signalgrass, purslane, lambsquarters, morningglory, pigweed, waterhemp	5, 15	preplant surface, preplant incorporated, or preemergence	Preplant surface applications may be made up to 14 days prior to planting. Preplant incorporated applications must be mixed into the upper 2 inches of the soil. See statement on page 31 for guidelines for applying products containing atrazine.
Callisto *mesotrione*	6.0-7.7 fl oz	Palmer amaranth, cutleaf eveningprimrose, marestail, pigweed spp., purslane, velvetleaf, waterhemp	27	preemergence	When emerged weeds are present, include an adjuvant such as MSO, COC, or NIS. MSO is preferred. The addition of AMS or UAN will generally improve weed control.
Capreno *thiencarbazone-methyl + tembotrione*	3.0-6.0 fl oz	lambsquarters, redroot pigweed, velvetleaf, waterhemp	2, 27	preemergence	Include COC if emerged weeds are present.
Corvus *thiencarbazone-methyl + isoxaflutole*	3.33-5.6 fl oz, depending upon soil texture and organic matter	Palmer amaranth, kochia, lambsquarters, marestail, pigweed spp., purslane, Russian thistle, velvetleaf, waterhemp, barnyardgrass, crabgrass, seedling Johnsongrass, broadleaf signalgrass	2, 27	preplant surface, preplant incorporated, or preemergence	Preplant applications may be made up to 21 days before planting corn.
Degree Xtra *acetochlor + atrazine*	2.9-3.7 qt, depending upon soil texture	barnyardgrass, crabgrass, browntop panicum, broadleaf signalgrass, cocklebur, kochia, annual morningglory, pigweed spp., waterhemp	5, 15	preplant incorporated or preemergence	For preplant incorporated applications, mix into the upper 1 inch of soil within 14 days prior to planting. For preemergence applications 0.5 to 0.75 inch rain or irrigation required for activation. See statement on page 31 for guidelines for applying products containing atrazine.

Table 3 continued. Preplant and preemergence herbicides for residual weed control.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
DiFlexx DUO *dicamba + tembotrione*	32-40 fl oz	Palmer amaranth, kochia, lambsquarters, marestail, pigweeds, velvetleaf, waterhemp	4, 27	preemergence	Use in a tank mix with atrazine to improve spectrum of weed control.
Dual II Magnum *S-metolachlor*	1.0-2.0 pt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, broadleaf signalgrass, Palmer amaranth, pigweed spp., purslane, waterhemp.	15	preplant surface, preplant incorporated, or preemergence	For preplant applications, mix into the upper 2 inches of soil within 14 days prior to planting corn.
Expert *atrazine + S-metolachlor + glyphosate*	2.5-3.75, depending upon soil texture and organic matter	barnyardgrass, crabgrass, yellow nutsedge, Palmer amaranth, kochia, lambsquarters, pigweed spp., purslane, velvetleaf, waterhemp	5, 9, 15	Preplant or preemergence	See statement on page 31 for guidelines for applying products containing atrazine.
Guardsman Max *dimethenamid-P + atrazine*	2.5-4.6 pt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, broadleaf signalgrass, Palmer amaranth, cocklebur, kochia, lambsquarters, morningglory, pigweed spp., purslane, velvetleaf, waterhemp, **partial control of Texas panicum**	5, 15	preplant surface, preplant incorporated, or preemergence	Preplant surface applications may be made up to 45 days prior to planting. For preplant incorporated applications, mix into the upper 1 to 2 inches of soil up to 2 weeks prior to planting. See statement on page 31 for guidelines for applying products containing atrazine.
Hornet WDG *clopyralid + flumetsulam*	4.0-5.0 oz	Palmer amaranth, cocklebur, marestail, lambsquarters, pigweed spp., purslane, sicklepod, sunflower, velvetleaf	2, 4	preplant incorporated, preplant surface, or preemergence	Preplant incorporated applications must be mixed into the soil to a depth of 2 to 3 inches. For surface applications, rain or irrigation sufficient to moisten soil to a depth of 2 inches is needed for activation.
Keystone NXT *acetochlor + atrazine*	1.4-3.0 qt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, browntop panicum, broadleaf signalgrass, cocklebur, kochia, lambsquarters, morningglory spp., pigweed spp., sunflower, velvetleaf, waterhemp, **partial control of Texas panicum**	5,15	preplant incorporated or preemergence	For preplant incorporated applications, mix into the upper 2 inch of soil within 14 days prior to planting. For preemergence applications, a minimum of 0.25 inch rain or irrigation required for activation. See statement on page 31 for guidelines for applying products containing atrazine.
LeadOff *rimsulfuron + thifensulfuron-methyl*	1.5-2.7 oz	kochia, lambsquarters, marestail, pigweed (prostrate, redroot, smooth), broadleaf signalgrass	2	preplant surface or preemergence	If emerged weeds are present at application, include COC, MSO, or NIS. An ammonium nitrogen fertilizer may also be included.

Table 3 continued. Preplant and preemergence herbicides for residual weed control.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Lexar *S-metolachlor + atrazine + mesotrione*	3.0-3.5 qt, depending upon soil organic matter	Palmer amaranth, barnyardgrass, crabgrass, devil's claw, marestail, kochia, lambsquarters, browntop panicum, pigweed spp., purslane, broadleaf signalgrass, velvetleaf, waterhemp, **partial control of Texas panicum**	5, 15, 27	preplant surface or preemergence	May be applied preplant up to 14 days prior to planting. See statement on page 31 for guidelines for applying products containing atrazine.
Linex 4L *linuron*	1.0-1.5 pt	Palmer amaranth, lambsquarters, pigweed spp., purslane, waterhemp, barnyardgrass, large crabgrass	7	preemergence	May be tank mixed with atrazine, Prowl, or Dual Magnum II for improved residual control
Lumax *S-metolachlor + atrazine + mesotrione*	2.5-3.0 qt, depending upon soil organic matter	Palmer amaranth, barnyardgrass, crabgrass, devil's claw, marestail, kochia, lambsquarters, browntop panicum, pigweed spp., purslane, broadleaf signalgrass, velvetleaf, waterhemp, **partial control of Texas panicum**	5, 15, 27	preplant surface or preemergence	May be applied preplant up to 14 days prior to planting. See statement on page 31 for guidelines for applying products containing atrazine.
Optill *saflufenacil + imazethapyr*		lambsquarters, smallflower morningglory, pigweed (prostrate, smooth, redroot), purslane, Russian thistle	2, 14	preplant incorporated or preemergence	If emerged weeds are present, include MSO at 1% v/v plus AMS at 8.5-17 lb/100 gal or UAN at 1.25-2.5 gal/100 gal.
Outlook *dimethenamid-P*	12-21 fl oz, depending upon soil texture and organic matter	barnyardgrass, crabgrass, broadleaf signalgrass, Palmer amaranth, lambsquarters, pigweeds, purslane, waterhemp, rice flatsedge, **partial control of Texas panicum**	15	preplant surface, preplant incorporated, or preemergence.	If emerged weeds are present, include COC or NIS and/or UAN or AMS to improve burndown activity.
Prequel *rimsulfuron + isoxaflutole*	1.66-2.5 oz	barnyardgrass, crabgrass, seedling Johnsongrass, Texas panicum, shattercane, broadleaf signalgrass, cocklebur, kochia, marestail, ivyleaf morningglory, Palmer amaranth, pigweed spp., purslane, giant ragweed, sunflower, velvetleaf, waterhemp	2, 27	preplant surface, preplant incorporated, or preemergence	Do not apply to coarse soils with less than 1% organic matter. Include NIS and an ammonium nitrogen fertilizer if emerged weeds are present at application.
Prowl H_2O *pendimethalin*	2.0-4.0 pt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, seedling Johnsongrass, Texas panicum, Palmer amaranth, kochia, lambsquarters, pigweed spp., purslane, waterhemp	3	preemergence	Plant corn at least 1.5 inches deep.

Table 3 continued. Preplant and preemergence herbicides for residual weed control.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Resicore *acetochlor + mesotrione + clopyralid*	2.25-3.0 qt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, browntop panicum, broadleaf signalgrass, pigweed spp., cocklebur, devil's claw, marestail, lambsquarters, annual morningglories, sunflower, velvetleaf, waterhemp, **partial control of Texas panicum**	4, 15, 27	preplant surface, preplant incorporated, or preemergence	For preplant incorporated applications, mix into the upper 2 inch of soil within 14 days prior to planting. For preemergence applications, a minimum of 0.25 inch rain or irrigation required for activation.
Resolve Q *rimsulfuron + thifensulfuron-methyl*	1.25-2.5 oz	barnyardgrass, kochia, lambsquarters, pigweeds (prostrate, redroot, smooth), purslane, broadleaf signalgrass	2	preplant incorporated or preemergence	If emerged weeds are present at application, include NIS, COC, or MSO, along with an ammonium nitrogen fertilizer.
Sharpen *saflufenacil*	2.0-3.5 fl oz, depending upon soil texture	Palmer amaranth, cocklebur, marestail, kochia, lambsquarters, morningglory (entireleaf, ivyleaf, pitted, and tall), pigweed spp., purslane, giant ragweed, sunflower, Russian thistle, velvetleaf, waterhemp	14	preplant surface, preplant incorporated, or preemergence	If emerged weeds are present at application, include MSO at 1% v/v and AMS at 8.5 to 17 lb/100 gal or UAN at 1.25 to 2.5 gal/100 gal.
SureStart, TripleFlex *acetochlor + flumetsulam + clopyralid*	1.5-3.0 pt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, Palmer amaranth, cocklebur, marestail, kochia, ivyleaf morningglory, sunflower, velvetleaf, waterhemp	2, 4, 15	preplant incorporated, preemergence	For preplant incorporated applications, mix into the upper 2 inch of soil within 14 days prior to planting. For preemergence applications, a minimum of 0.25 inch rain or irrigation required for activation.
Valor SX *flumioxazin*	2.0-3.0 oz	cutleaf eveningprimrose, henbit, lambsquarters, marestail, pigweed spp., prickly sida, purslane, smallflower morningglory	14	preplant surface	Corn may be planted 14 to 30 days after application. If at least 25% of the soil surface is covered by residue, and at least 0.25" rain is received, corn may be planted 7 days after 2.0 oz is applied
Verdict *saflufenacil + dimethenamid-P*	10-18 fl oz, depending upon soil texture	Palmer amaranth, cocklebur, marestail, kochia, lambsquarters, morningglory (entireleaf, ivyleaf, pitted, and tall), pigweeds, purslane, giant ragweed, sunflower, Russian thistle, velvetleaf, waterhemp, barnyardgrass, crabgrass, shattercane, broadleaf signalgrass	14, 15	preplant surface, preplant incorporated, or preemergence.	For preplant incorporated applications, mix into the upper 1 to 2 inches of soil up to 14 days before planting.
Warrant *acetochlor*	1.5-3.0 qt, depending upon soil texture	barnyardgrass, crabgrass, browntop panicum, lambsquarters, pigweed spp., waterhemp	15	preplant or preemergence	0.5 to 0.75 inch rain or irrigation required for activation. If application is followed by conditions not favorable for crop growth, crop injury may occur.

Table 3 continued. Preplant and preemergence herbicides for residual weed control.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Zemax *S-metolachlor + mesotrione*	2.0-2.4 qt, depending upon soil organic matter	Palmer amaranth, barnyardgrass, large crabgrass, lambsquarters, purslane, velvetleaf, waterhemp	15, 27	preplant or preemergence	May be applied up to 14 days before planting corn.
Zidua *pyroxasulfone*	1.5-4.0 oz, depending upon soil texture	barnyardgrass, crabgrass, seedling Johnsongrass, broadleaf signalgrass, Palmer amaranth, pigweed spp., purslane, waterhemp	15	preplant surface, preplant incorporated, or preemergence	Preplant surface applications may be made up to 45 days prior to planting. Preplant incorporated applications may be made up to 14 days before planting.

Table 4. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
2,4-D products *2,4-D*	0.5.-1.0 pt (4 lb/gal product)	cocklebur, kochia, lambsquarters, common and ivyleaf morningglory, pigweed spp., purslane, giant ragweed, Russian thistle, sunflower, velvetleaf	4	Postemergence to weeds in corn up to 8 inches tall. Use drop nozzles after corn reaches 8 inches tall.	Do not apply to open whorls, or from 2 weeks before tasseling to dough stage. Include NIS at 0.25% v/v.
AAtrex Nine-O *atrazine*	up to 2.2 lb	annual morningglory, cocklebur, lambsquarters, pigweed, velvetleaf	5	Postemergence to weeds less than 1.5 inches in height and before corn exceeds 12 inches tall.	See statement on page 31 for guidelines for applying products containing atrazine.
Accent *nicosulfuron*	0.33-1.33 oz	barnyardgrass, broadleaf signalgrass, Johnsongrass, shattercane, Texas and browntop panicum, morningglory (ivyleaf, pitted, tall), redroot and smooth pigweed	2	Postemergence to weeds in corn up to V6 stage or 20 inches tall. Use drop nozzles for corn from 20 to 36 inches tall.	Include NIS at 0.25% v/v, or MSO or COC at 1% v/v, along with an UAN at 2-4 qt/A or AMS at 2-4 lb/A.
Accent Q *nicosulfuron*	0.45-1.8 oz	barnyardgrass, broadleaf signalgrass, Johnsongrass, shattercane, Texas and browntop panicum, morningglory (ivyleaf, pitted, tall), redroot and smooth pigweed	2	Postemergence to weeds in corn up to V6 stage or 20 inches tall. Use drop nozzles for corn from 20 to 36 inches tall.	Include NIS at 0.25% v/v, or MSO or COC at 1% v/v, along with an UAN at 2-4 qt/A or AMS at 2-4 lb/A.
Acuron *S-metolachlor + atrazine + mesotrione + bicyclopyrone*	2.5-3.0 pt, depending upon soil organic matter	Palmer amaranth, cocklebur, devil's claw, marestail, kochia, lambsquarters, ivyleaf morningglory, pigweed spp., purslane, sunflower, velvetleaf, waterhemp	5, 15, 27	Prior to weed emergence before corn reaches 12 inches tall.	Include NIS at 0.25% v/v for control of emerged small (<3") broadleaf weeds. See statement on page 31 for guidelines for applying products containing atrazine.
Acuron Flexi *S-metolachlor + mesotrione + bicyclopyrone*	2.0-2.25 qt, depending upon soil organic matter	Palmer amaranth, cocklebur, marestail, lambsquarters, ivy- and entireleaf morningglory, pigweed spp., purslane, velvetleaf, waterhemp	15, 27	Postemergence to weeds in corn up to 30 inches tall or 8-leaf stage of growth.	Include NIS at 0.25 % v/v.
Aim EC *carfentrazone-ethyl*	2.0 fl oz	lambsquarters, ivyleaf, entireleaf, and pitted morningglory, pigweed spp., velvetleaf, waterhemp, cocklebur, hophornbeam copperleaf, kochia, Russian thistle	14	Postemergence to weeds in corn from emergence up to 14-leaf collar stage. For application later than V8 stage, use drop nozzles.	Include NIS at a rate of 0.25% v/v.

Table 4 continued. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Anthem *pyroxasulfone + fluthiacet-methyl*	5.0-12.0 fl oz, depending upon soil texture and organic matter	spreading dayflower, kochia, lambsquarters, annual morningglory, pigweed (redroot, smooth, and spiny), Russian thistle, velvetleaf, waterhemp, also residual control of many species	14, 15	Postemergence to small weeds in corn up to V4 stage.	Include NIS at 0.25% v/v, COC at up to 2.5% v/v, or silicone-based surfactant at 0.25% v/v for postemergence weed control.
Armezon *topramezone*	0.5-1.0 fl oz	Palmer amaranth, cocklebur, marestail, kochia, pigweed spp., giant ragweed, sunflower, Russian thistle, velvetleaf, waterhemp, barnyardgrass, crabgrass	27	Postemergence to small weeds.	Include MSO or COC at 1-1.5% v/v and UAN at 1.25-2.5 gal/100 gal or AMS at 8.5-17 lb/100 gal.
Armezon PRO *topramezone + dimethenamid-P*	14-24 fl oz, depending upon soil texture and organic matter	Palmer amaranth, cocklebur, marestail, kochia, lambsquarters, morningglory spp., pigweed spp., giant ragweed, sunflower, Russian thistle, velvetleaf, waterhemp, barnyardgrass	15, 27	Broadcast to small weed seedlings in corn from emergence to 12 inches tall. Use drop nozzles in corn from 12 to 30 inches tall.	Use MSO or COC at 0.5 to 1.0% v/v or NIS at 0.25% v/v for postemergence weed control.
Atrazine 4L *atrazine*	up to 4.0 pt	annual morningglory, cocklebur, lambsquarters, pigweed, velvetleaf	5	Postemergence to weeds less than 1.5 inches in height and before corn exceeds 12 inches tall.	See statement on page 31 for guidelines for applying products containing atrazine.
Balance Flexx *Isoxaflutole*	3.0-6.0 fl oz, depending upon soil texture and organic matter	Palmer amaranth, kochia, lambsquarters, marestail, pigweed spp., Russian thistle, sunflower, velvetleaf, waterhemp	27	Prior to weed emergence in corn from spiking through V2 leaf stage.	Tank mixtures with other herbicides or adjuvants are not recommended as these may increase crop injury.
Basagran *bentazon*	1.0-2.0 pt	cocklebur, lambsquarters, smallflower morningglory, purslane, sunflower, velvetleaf	6	Postemergence to small broadleaf weeds.	The addition of COC at 1-2 pt/A, UAN at 4-8 pt/A, or AMS at 2-5 lb/A is required.
Beacon *primisulfuron-methyl*	0.76 oz	Johnsongrass, shattercane, cocklebur, devil's claw, lambsquarters, pigweed spp., sunflower, velvetleaf	2	Postemergence broadcast to weeds in corn from 4 to 20 inches tall. Use drop nozzles in corn taller than 20 inches.	Use either NIS at 0.25% v/v or COC at up to 2.5% v/v. Liquid nitrogen fertilizer may be added at 2-4 qt/A, or AMS at 2-4 lb/A.

Table 4 continued. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Bicep II Magnum *S-metolachlor + atrazine*	1.3-2.58 qt, depending upon soil texture and organic matter	barnyardgrass, cocklebur, crabgrass, kochia, lambsquarters, morningglory, pigweed, purslane, velvetleaf, waterhemp	5, 15	Early postemergence or postemergence directed to weeds at 2-leaf stage of growth, before corn reaches 12 inches tall.	See statement on page 31 for guidelines for applying products containing atrazine.
Broclean *bromoxynil*	1.0-2.0 pt	cocklebur, lambsquarters, silverleaf nightshade, sunflower, giant ragweed, ivyleaf, pitted, and tall morningglory, kochia, Russian thistle, tall waterhemp, velvetleaf	5	Postemergence to small weeds in corn between 4-leaf stage and tassel emergence.	Contact herbicide, spray coverage is critical for good weed control.
Brozine *bromoxynil + atrazine*	1.5-3.0 pt	cocklebur, lambsquarters, ivyleaf morningglory, kochia, marestail, pitted morningglory, Russian thistle, waterhemp, velvetleaf	5	Postemergence to small weeds before corn reaches 12 inches tall.	See statement on page 31 for guidelines for applying products containing atrazine.
Cadet *fluthiacet-methyl*	0.4-0.9 fl oz	spreading dayflower, kochia, lambsquarters, annual morningglory, redroot and smooth pigweed, velvetleaf, waterhemp	14	Postemergence to small weeds in corn up to 48 inches tall, but before tasseling.	Include NIS at 0.25% v/v, COC at up to 2.5% v/v, or a silicone-based surfactant at 0.25 % v/v. Use a minimum of 15 GPA for ground applications.
Callisto *mesotrione*	3.0 fl oz	cocklebur, lambsquarters, pigweed (redroot, smooth, and tumble), giant ragweed, sunflower, velvetleaf, waterhemp	27	Postemergence to small weeds in corn up to V8 stage or 30 inches tall.	Include COC at 1% v/v or NIS at 0.25 % v/v. COC is preferred and will provide better weed control. Do not use MSO, as severe crop injury may result.
Callisto GT *mesotrione + glyphosate*	2.0 pt	Many annual and perennial grass and broadleaf weeds	9, 27	Postemergence to small weeds in corn up to V8 stage or 30 inches tall.	**Only use in glyphosate-tolerant corn.** Apply with NIS at 0.25 % v/v and AMS at 8.5-17 lb/100 gal. Will also provide residual control of newly emerging broadleaf weeds.
Callisto Xtra *atrazine + mesotrione*	20-24 fl oz	Palmer amaranth, cocklebur, large crabgrass, marestail, lambsquarters, entire-ivy- and pitted morningglory, pigweed spp., broadleaf signalgrass, sunflower, velvetleaf, waterhemp	5, 27	Postemergence before corn reaches 12 inches tall.	Include COC at 1% v/v or NIS at 0.25% v/v in addition to UAN at 1.5 gal/100 gal or AMS at 8.5-17 lb/100 gal. See statement on page 31 for guidelines for applying products containing atrazine. Will also provide residual control of newly emerging broadleaf weeds.

Table 4 continued. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Capreno *thiencarbazone-methyl + tembotrione*	3.0 fl oz	Palmer amaranth, cocklebur, kochia, lambsquarters, smell melon, pigweed spp., giant ragweed, Russian thistle, velvetleaf, waterhemp	2, 27	Postemergence to small weeds in corn from V1 to V5 stage of growth.	Include COC at 1% v/v along with UAN at 1.5 qt/A or AMS at 1.5 lb/A.
Celebrity Plus *dicamba + diflufenzopyr + nicosulfuron*	4.7 oz	barnyardgrass, broadleaf signalgrass, browntop and Texas panicum, johnsongrass, cocklebur, devil's claw, kochia, lambsquarters, morningglory (entireleaf, ivyleaf, pitted, smallflower, and tall), pigweed spp., purslane, giant ragweed, smellmelon, sunflower, Russian thistle, velvetleaf, waterhemp	2, 4	Postemergence in corn from 4 to 24 inches tall. Use drop nozzles if corn is larger than 20 inches tall or V6.	Must include NIS at 0.25-0.5% v/v and UAN at 1-2 qt/A or AMS at 1-2 lb/A.
Clarity *dicamba*	0.5-1.0 pt, depending upon soil texture	Palmer amaranth, cocklebur, hophornbeam copperleaf, kochia, lambsquarters, ivyleaf and tall morningglory, pigweeds, purslane, giant ragweed, sunflower, velvetleaf	4	Postemergence to small, actively growing broadleaf weeds in corn from emergence to V5 stage.	The addition of NIS at 0.25% v/v, COC at 1 qt/A, UAN at 2-4 qt/A, or AMS at 2.5 lb/A will help improve weed control.
Degree Xtra *acetochlor + atrazine*	2.9-3.7 qt, depending upon soil texture	barnyardgrass, crabgrass, browntop panicum, broadleaf signalgrass, cocklebur, kochia, annual morningglory, pigweed spp., waterhemp	5, 15	Prior to weed emergence in corn up to 11 inches tall.	0.5 to 0.75 inch rain or irrigation required for activation. See statement on page 31 for guidelines for applying products containing atrazine.
DiFlexx *dicamba*	6-16 fl oz	Palmer amaranth, cocklebur, cutleaf eveningprimrose, kochia, lambsquarters, marestail, morningglory (ivyleaf, tall), pigweed spp., purslane, sunflower, Russian thistle, velvetleaf, waterhemp	4	Postemergence broadcast to small weeds in corn from spiking through V10 stage or 36 inches tall.	Include NIS at 0.25% v/v, or COC or MSO at 1% v/v, along with either UAN at 2-4 qt/A or AMS at 8.5-17 lb/100 gal to improve postemergence weed control.
DiFlexx DUO *dicamba + tembotrione*	24-40 fl oz	Palmer amaranth, cocklebur, hophornbeam copperleaf, giant ragweed	4, 27	Broadcast in corn from emergence to V7 stage or 36 inches tall. Drop nozzles can be used for applications to corn from V7 through V10, 36 inches tall, or 15 days prior to tassel, whichever occurs first.	Include MSO or COC at 1% v/v and either UAN at 1.5 qt/A or AMS at 8.5-17 lb/100 gal for postemergence applications.

Table 4 continued. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Diuron 4L *diuron*	0.6-0.8 qt	barnyardgrass, crabgrass, lambsquarters, pigweed, purslane, ragweed	7	Postemergence directed in corn that is at least 20 inches tall.	**Do not apply over the top of corn.** Apply 0.6 qt/A with nonpressure nitrogen solution. If nitrogen solution is not used, apply 0.8 qt/A with NIS at 0.5% v/v.
Dual II Magnum *S-metolachlor*	up to 2.0 pt	barnyardgrass, crabgrass, broadleaf signalgrass, Palmer amaranth, pigweed spp., purslane, waterhemp.	15	Prior to weed emergence in corn up to 40 inches tall.	Will not control emerged weeds.
Evik DF *ametryn*	0.75 to 2.0 lb, depending upon weed species and size	broadleaf signalgrass, Texas panicum, barnyardgrass, crabgrass, cocklebur, lambsquarters, morningglory, pigweed, velvetleaf	5	Postemergence directed after corn reaches 12 inches tall.	Include a surfactant such as X-77, DuPont WK, or Tronic at a rate of 0.5% v/v.
Expert *atrazine + S-metolachlor + glyphosate*	2.5-3.75, depending upon soil texture and organic matter	barnyardgrass, crabgrass, johnsongrass, junglerice, browntop and Texas panicum, Palmer amaranth, cocklebur, kochia, lambsquarters, pigweed spp., sunflower, Russian thistle, velvetleaf, waterhemp	5, 9, 15	Postemergence before corn reaches 12 inches tall.	**Only use in glyphosate-tolerant corn.** Do not mix with other products after corn emergence. See statement on page 31 for guidelines for applying products containing atrazine.
Glyphosate products *glyphosate*	varied, refer to individual product label	many annual and perennial grass and broadleaf weeds	9	Postemergence broadcast in corn up to V8 stage or 30 inches tall. Use drop nozzles in corn from 30 to 48 inches tall.	**Only for use in glyphosate-tolerant corn.** Include 8.5-17 lb/A AMS.
Gramoxone SL *paraquat*	1.0-2.0 pt	Many annual grass and broadleaf weeds	22	Postemergence directed to labeled weeds in corn at least 10 inches tall.	**Must be applied using a hooded or shielded sprayer.** Corn will be damaged anywhere spray contacts foliage. Include NIS at 0.25 % v/v or COC at 1% v/v.
Guardsman Max *dimethenamid-P + atrazine*	2.5-4.6 pt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, broadleaf signalgrass, Palmer amaranth, cocklebur, kochia, lambsquarters, morningglory, pigweed spp., purslane, velvetleaf, waterhemp, **partial control of Texas panicum**	5, 15	Early postemergence before corn reaches 12 inches tall, before weeds reach 1.5 inches tall.	Surfactants, low-rate fertilizer, or crop oil may be used to improve postemergence control. See statement on page 31 for guidelines for applying products containing atrazine.

Table 4 continued. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Halex GT *S-metolachlor + glyphosate + mesotrione*	3.6-4.0 pt	many annual and perennial grass and broadleaf weeds	9, 15, 27	Postemergence in corn up to V8 stage or 30 inches tall.	**Only for use in glyphosate tolerant corn.** Include NIS at 0.25-0.5% v/v and AMS 8.5-17 lb.100 gal. Will provide residual control of newly emerging susceptible weeds.
Harmony SG *thifensulfuron-methyl*	0.125 oz	velvetleaf, pigweed spp., lambsquarters	2	Postemergence to weeds in corn from 2 to 6 leaf stage, up to 16 inches tall.	Only use in hybrids with a relative maturity of 88 days or more. Include either NIS at 0.25% v/v or COC at 1% v/v, along with UAN at 2-4 qt/A or AMS at 2-4 lb/A.
Keystone NXT *acetochlor + atrazine*	1.4-3.0 qt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, browntop panicum, broadleaf signalgrass, cocklebur, kochia, lambsquarters, morningglory spp., pigweed spp., sunflower, velvetleaf, waterhemp, **partial control of Texas panicum**	5,15	Prior to weed emergence in corn up to 11 inches tall.	For preplant incorporated applications, mix into the upper 2 inch of soil within 14 days prior to planting. For preemergence applications, a minimum of 0.25 inch rain or irrigation required for activation. See statement on page 31 for guidelines for applying products containing atrazine.
Kochiavore *2,4-D + bromoxynil + fluroxypyr*	1.0-1.5 pt	cocklebur, devil's claw, lambsquarters, morningglory, pigweed spp., sunflower, Russian thistle, velvetleaf, **suppression of kochia, field bindweed**	4, 6	Broadcast in corn from V3 to V5. Use drop nozzles from V6 stage. Do not apply from 2 wks before tasseling to dough stage.	Do not use with atrazine, crop oils, or other adjuvants. Do not cultivate for 7 to 10 days after application. Do not use on sandy soils.
Laudis *tembotrione*	3.0 fl oz	Palmer amaranth, cocklebur, kochia, lambsquarters, pigweed spp., giant ragweed, sunflower, Russian thistle, velvetleaf, waterhemp, barnyardgrass, seedling Johnsongrass, Texas panicum, shattercane, broadleaf signalgrass	27	Postemergence to small weeds in corn from emergence to the V8 stage of growth.	Include MSO at 1% v/v along with 1.5 qt/A UAN or 1.5 lb/A AMS.
Lexar *S-metolachlor + atrazine + mesotrione*	3.0-3.5 qt, depending upon soil organic matter	Palmer amaranth, cocklebur, large crabgrass, devil's claw, marestail, kochia, lambsquarters, pigweed spp., purslane, broadleaf signalgrass, velvetleaf, waterhemp	5, 15, 27	Early postemergence to small broadleaf weeds, before corn reaches 12 inches tall.	Include NIS at 0.25 % v/v for postemergence applications. See statement on page 31 for guidelines for applying products containing atrazine.

Table 4 continued. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Liberty 280 SL *glufosinate-ammonium*	22 fl oz	cocklebur, devil's claw, kochia, lambsquarters, morningglory (entireleaf, ivyleaf, pitted, sharppod, smallflower, and tall), pigweed spp., purslane, smellmelon, sunflower, Russian thistle, velvetleaf, barnyardgrass, seedling Johnsongrass, junglerice, Texas panicum, shattercane, broadleaf signalgrass, sprangletop	10	Postemergence broadcast to weeds in corn up to V7 stage or 24 inches tall. Use drop nozzles for applications in corn from 24 to 36 inches tall.	**Use only with LibertyLink corn.** Apply under warm temperatures, high humidity, and full sunlight for best results. Use AMS at 1.5 to 3.0 lb/A and apply in a minimum of 15 GPA.
Lightning *imazethapyr + imazapyr*	1.28 oz	cocklebur, kochia, lambsquarters, morningglory (entireleaf, ivyleaf, pitted, smallflower, and tall), pigweed spp. (Palmer, prostrate, redroot, smooth, and spiny), giant ragweed, sunflower, velvetleaf, barnyardgrass, seedling Johnsongrass, shattercane	2	Postemergence broadcast to weeds in corn up to V6 or 20 inches tall. Use drop nozzle for later applications.	**Use only with Clearfield corn hybrids.** Include NIS at 0.25% v/v or COC, along with UAN at 1-2 qt/A or AMS at 2.5 lb/A.
Linex 4L *linuron*	1.25-1.5 pt	annual morningglories, cocklebur, common dayflower, kochia, lambsquarters, pigweed spp. (prostrate, redroot, and smooth), purslane, velvetleaf, barnyardgrass, broadleaf signalgrass, Texas panicum	7	Directed postemergence in corn at least 15 inches tall.	Apply only when there is sufficient differential between crop and weed height.
Lumax *S-metolachlor + atrazine + mesotrione*	2.5-3.0 qt, depending upon soil organic matter	Palmer amaranth, cocklebur, large crabgrass, devil's claw, marestail, kochia, lambsquarters, pigweed spp., purslane, broadleaf signalgrass, velvetleaf, waterhemp	5, 15, 27	Early postemergence to small broadleaf weeds, before corn reaches 12 inches tall.	Include NIS at 0.25 % v/v for postemergence applications. See statement on page 31 for guidelines for applying products containing atrazine.
Northstar *dicamba + primisulfuron*	5.0 oz	Johnsongrass, yellow nutsedge, shattercane, sorghums, Palmer amaranth, cocklebur, devil's claw, cutleaf eveningprimrose, marestail, kochia, lambsquarters, morningglory spp., pigweed spp., purslane, giant ragweed, sunflower, Russian thistle, velvetleaf, waterhemp	2, 4	Postemergence in corn from 4 to 12 inches tall. Drop nozzles may be used to apply up to 20 inches tall (V6).	Use with either NIS at 0.25% v/v or COC 1-4 pt/A.

Table 4 continued. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Outlook *dimethenamid-P*	12-21 fl oz, depending upon soil texture and organic matter	barnyardgrass, crabgrass, broadleaf signalgrass, Palmer amaranth, lambsquarters, pigweeds, purslane, waterhemp, rice flatsedge, **partial control of Texas panicum**	15	Prior to weed emergence in corn up to 12 inches tall. Application can be made to corn between 12 and 36 inches tall with directed sprays.	If emerged weeds are present, include NIS at 0.25-0.5% v/v or COC and/or UAN at 1-2 gal/A or AMS at 8-17 lb/100 gal to improve burndown activity.
Peak *prosulfuron*	0.5-1.0 oz	Palmer amaranth, cocklebur, devil's claw, marestail, kochia, lambsquarters, pigweed spp., giant ragweed, sunflower, Russian thistle, waterhemp	2	Postemergence broadcast in corn between 4 and 20 inches tall. Use drop nozzles in corn from 20 to 30 inches tall.	Use either NIS at 0.25-0.5% v/v or COC. In drier climates, COC is preferred. UAN at 0.5-1 gal/A or AMS at 2 lb/A may also be added.
Permit *halosulfuron*	0.67-1.33 oz	cocklebur, devil's claw, rice flatsedge, yellow nutsedge, purple nutsedge, redroot and smooth pigweed, sunflower, velvetleaf	2	Postemergence broadcast in corn from spike to 24 inches tall. Use drop nozzles for applications after corn reaches 24 inches.	Use NIS at 0.25-0.5% v/v or COC at 1% v/v. AMS at 2-4 lb/A may be used to improve weed control.
Prowl H_2O *pendimethalin*	1.5-3.0 pt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, seedling Johnsongrass, Texas panicum, Palmer amaranth, kochia, lambsquarters, pigweed spp., purslane, waterhemp	3	Prior to weed emergence in corn up to V8 stage or 30 inches tall, or postemergence incorporated (culti-spray) in corn from 4 inches tall until layby.	For culti-spray applications, crop must be cultivated such that at least 1 inch of soil is thrown over the base of corn plants, to prevent herbicide from affecting brace root formation.
Realm Q *rimsulfuron + mesotrione*	4.0 oz	Palmer amaranth, barnyardgrass, cocklebur, kochia, Texas panicum, pigweed spp., giant ragweed, shattercane, sunflower, velvetleaf, waterhemp	2, 27	Postemergence broadcast in corn up to V6 stage or 20 inches tall.	Include COC at 1% v/v or HSOC at 0.5% v/v. NIS at 0.25% v/vmay be used, but will result in less consistent weed control than COC or HSOC. Always include UAN at 2 qt/A or AMS at 2 lb/A.
Resicore *acetochlor + mesotrione + clopyralid*	2.25-3.0 qt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, browntop panicum, broadleaf signalgrass, pigweed spp., cocklebur, devil's claw, marestail, lambsquarters, annual morninglories, sunflower, velvetleaf, waterhemp, **partial control of Texas panicum**	4, 15, 27	Prior to weed emergence, or before broadleaf weeds reach 3 inches tall, to corn up to 11 inches tall.	Will not control emerged grass weeds, include a grass herbicide tank mix partner.

Table 4 continued. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Resolve Q *rimsulfuron + thifensulfuron-methyl*	1.25 oz	barnyardgrass, lambsquarters, pigweed (prostrate, redroot, smooth), sunflower, velvetleaf	2	Postemergence to small weeds in corn up to V7 stage or 20 inches tall.	Include NIS at 0.25% v/v, or COC or MSO at 1% v/v, along with UAN at 2 qt/A or AMS at 2 lb/A.
Resource *flumiclorac*	4.0-6.0 fl oz broadcast, 4.0-8.0 fl oz w/drop nozzles	common ragweed, velvetleaf, prostrate and smooth pigweeds, prickly sida, velvetleaf	14	Postemergence to weeds in corn from 2- to 10-leaf stage.	Use COC or MSO. Some tank mixture may require NIS. AMS at 2-2.5 lb/A or UAN at 1-2 qt/A may be added, but do not replace the need for COC, MSO, or NIS.
Sequence *S-metolachlor + glyphosate*	3.5 pt, depending upon soil texture	Many annual and perennial grass and broadleaf weeds	9, 15	Postemergence broadcast in corn up to V8 stage or 30 inches tall. Use drop nozzles for applications to corn from 30 to 48 inches tall.	**Only for use in glyphosate-tolerant corn.** Will also provide residual control of susceptible weeds. Include AMS at 8.5-17 lb/100 gal for optimal weed control.
Solstice *fluthiacet-methyl + mesotrione*	2.5-3.15 fl oz	broadleaf signalgrass, cocklebur, lambsquarters, morningglory (entireleaf, ivyleaf, and pitted), pigweed (redroot, smooth, and tumble), giant ragweed, sunflower, Russian thistle, velvetleaf, waterhemp	14, 27	Postemergence to weeds in corn up to V8 stage or 30 inches tall.	Use COC at 0.5-1% v/v or NIS at 0.25% v/v. COC is preferred as it will provide better weed control. MSO is not recommended as it can cause severe crop injury.
Spirit *prosulfuron + primisulfuron-methyl*	1.0 oz	Palmer amaranth, cocklebur, devil's claw, marestail, kochia, lambsquarters, pigweed spp., giant ragweed, sunflower, velvetleaf, waterhemp	2	Postemergence broadcast in corn from 4 to 20 inches tall. Use drop nozzles for applications in corn from 20 to 24 inches tall.	Use NIS at 0.25-0.5% v/v or COC at 1-4 pt/A. COC is preferred in drier climates. A liquid nitrogen fertilizer may also be added at 2-4 qt/A, or AMS at 2-4 lb/A.
Starane NXT *fluroxypyr + bromoxynil*	14 fl oz from emergence to V5 21-27.4 fl oz from V4 to V5	**14 fl oz**: cocklebur, kochia, lambsquarters, sunflower **21-27.4 fl oz:** above, plus ivyleaf, pitted, and tall morningglory, pigweed spp., purslane, velvetleaf, tall waterhemp	4, 6	14 fl oz rate: from corn emergence to V5 stage 21-27.4 fl oz rate: from V4 to V5 stage	The addition of NIS or COC is not required, but may help optimize herbicidal activity.

Table 4 continued. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Starane Utra *fluroxypyr*	0.4 pt	cocklebur, purslane, kochia, morningglory, sunflower, velvetleaf	4	Postemergence broadcast in corn up to V5 stage. Use drop nozzles for applications after V5.	Crop injury may occur with some hybrids after broadcast applications, check with seed company for further information.
Status *dicamba + diflufenzopyr*	5-10 fl oz	Palmer amaranth, cocklebur, devil's claw, kochia, lambsquarters, marestail, morningglory (entireleaf, ivyleaf, pitted, smallflower, and tall), pigweed spp., purslane, giant ragweed, smellmelon, sunflower, Russian thistle, velvetleaf, waterhemp	4	Postemergence in corn from 4 inches tall to V10 stage.	Best results achieved by including NIS at 0.25% v/v, or MSO or COC at 1-2 pt/A along with UAN at 5 qt/100 gal or AMS at 5-17 lb/100 gal.
Steadfast *nicosulfuron + rimsulfuron*	0.75 oz	barnyardgrass, Johnsongrass, Texas panicum, shattercane, broadleaf signalgrass, annual morningglory, pigweed (redroot and smooth), sunflower	2	Postemergence to weeds in corn up to V5 stage or 12 inches tall.	Use only with corn hybrids with a relative maturity of 77 days or more. Include COC or MSO at 1% v/v, or NIS at 0.25% v/v in addition to UAN at 2 qt/A or AMS at 2 lb/A.
Steadfast Q *nicosulfuron + rimsulfuron*	0.75 oz	barnyardgrass, Johnsongrass, Texas panicum, shattercane, broadleaf signalgrass, annual morningglory, pigweed (redroot and smooth), sunflower	2	Postemergence to weeds in corn up to V5 stage or 12 inches tall.	Use only with corn hybrids with a relative maturity of 77 days or more. Include COC or MSO at 1% v/v, or NIS at 0.25% v/v in addition to UAN at 2 qt/A or AMS at 2 lb/A.
Stinger *clopyralid*	0.25-0.5 pt	cocklebur, common and giant ragweed, sunflower	4	Broadcast or postemergence directed to weeds in corn from emergence to 24 inches tall.	Most effective on weeds from emergence to 5-leaf stage of growth.
Stout *nicosulfuron + thifensulfuron-methyl*	0.5-0.75 oz	barnyardgrass, broadleaf signalgrass, Johnsongrass, shattercane, lambsquarters, morningglory (ivyleaf, pitted, tall), redroot and smooth pigweed, velvetleaf	2	Postemergence to weeds in corn up to V5 stage or 12 inches tall.	Include COC or MSO at 1% v/v, or NIS at 0.25% v/v in addition to UAN at 2 qt/A or AMS at 2 lb/A.
SureStart, TripleFlex *Acetochlor + flumetsulam + clopyralid*	1.5-3.0 pt, depending upon soil texture and organic matter	barnyardgrass, crabgrass, Palmer amaranth, cocklebur, marestail, kochia, ivyleaf morningglory, sunflower, velvetleaf, waterhemp	2, 4, 15	Prior to weed emergence in corn up to 11 inches tall.	If emerged weeds are present, include a glyphosate or glufosinate product if corn is glyphosate-tolerant or LibertyLink, respectively.

Table 4 continued. Postemergence herbicide options.

Product *Active Ingredient*	Rate/A	Key weeds controlled	Group #	Application timing	Notes
Treflan EC *trifluralin*	0.75-2.0 pt, depending upon soil texture	barnyardgrass, broadleaf signalgrass, crabgrass, guineagrass, junglerice, Texas panicum, sprangletop, lambsquarters, pigweed spp., purslane, Russian thistle	3	Postemergence incorporated before weeds emerge.	Must be mechanically incorporated within 24 hrs with a sweep-type cultivator or rolling cultivator.
Warrant *acetochlor*	1.5-3.0 qt, depending on soil texture	barnyardgrass, crabgrass, browntop panicum, lambsquarters, pigweed spp., waterhemp	15	Prior to weed emergence in corn up to 30 inches tall.	0.5 to 0.75 inch rain or irrigation required for activation. If application is followed by conditions not favorable for crop growth, crop injury may occur.
Widematch *clopyralid + fluroxypyr*	1.33 pt	cocklebur, kochia, morningglory, purslane, sicklepod, sunflower, velvetleaf	4	Broadcast postemergence to small broadleaf weeds in corn up to V5 stage of growth. After V5, use drop nozzles.	Generally, does not require the use of an adjuvant. However, adjuvants may be used to improve weed control.
Yukon *dicamba + halosulfuron*	4.0-8.0 oz	Palmer amaranth, cocklebur, devil's claw, cutleaf eveningprimrose, rice flatsedge, marestail, kochia, lambsquarters, yellow and purple nutsedge, pigweeds, purslane, giant ragweed, sunflower, velvetleaf, waterhemp	2, 4	Postemergence in corn from spike stage to 36 inches tall. Use drop nozzles in corn taller than 20 inches.	Use NIS at 0.25-0.5% v/v, or COC or MSO at 1% v/v. Nitrogen fertilizers may be added to improve weed control.
Zemax *S-metolachlor + mesotrione*	2.0-2.4 qt, depending upon soil organic matter	Palmer amaranth, cocklebur, marestail, lambsquarters, redroot and smooth pigweed, giant ragweed, velvetleaf, waterhemp	15, 27	Postemergence in corn up to V8 stage or 30 inches tall.	Include NIS at 0.25% v/v or COC at 1% v/v. The addition of UAN or AMS will improve weed control, but may increase crop injury. Do not use fertilizer carrier as severe crop injury will occur.
Zidua *pyroxasulfone*	1.0-4.0 oz, depending upon soil texture	barnyardgrass, crabgrass, seedling Johnsongrass, broadleaf signalgrass, Palmer amaranth, pigweed spp., purslane, waterhemp	15	Prior to weed emergence in corn from spiking up to V4 stage.	Include a tank mix partner if emerged weeds are present at application.

Table 5. Rotational restrictions.

Product Name	Active ingredient(s)	Corn	Cotton	Grain Sorghum	Soybean	Wheat
AAtrex Nine-O	atrazine	anytime	**	anytime	**	**
Accent, Accent Q	nicosulfuron	anytime	10 months	10 to 18 months*	15 days	4 months
Acuron	S-metolachlor + atrazine + mesotrione + bicyclopyrone	anytime	10 months*	10 months*	10 months*	4 months
Acuron Flexi	S-metolachlor + mesotrione + bicyclopyrone	anytime	10 months*	10 months*	10 months*	4 months
Aim EC	carfentrazone-ethyl	anytime	anytime	anytime	anytime	anytime
Anthem	pyroxasulfone + fluthiacet-methyl	anytime	4 months	6 to 12 months*	0 to 4 months*	11 to 18 months*
Armezon	topramezone	anytime	9 months	9 months	9 months	3 months
Armezon PRO	topramezone + dimethenamid-P	anytime	9 months	9 months	9 months	4 months
Atrazine 4L	atrazine	anytime	**	anytime	**	**
Axiom DF	flufenacet + metribuzin	anytime	8 months	12 months	anytime	7 days
Balance Pro, Flexx	isoxaflutole	anytime	10 months*	6 months	6 months	4 months
Basagran	bentazon	anytime	anytime	anytime	anytime	anytime
Beacon	primisulfuron-methyl	14 days	8 months	8 months	8 months	3 months
Bicep II Magnum	S-metolachlor + atrazine	anytime	next season*	anytime, with safened seed	next season*	next year
Brozine	bromoxynil + atrazine	anytime	**	anytime	**	**
Cadet	fluthiacet-methyl	anytime	anytime	anytime	anytime	anytime
Callisto	mesotrione	anytime	10 months	anytime	10 months	4 months
Callisto Xtra	atrazine + mesotrione	anytime	next season	anytime	next season	next year
Capreno	thiencarbazone-methyl + tembotrione	anytime	10 months*	10 months*	10 months*	4 months
Celebrity	dicamba + diflufenzopyr + nicosulfuron	1 week	10 months	10 to 18 months, depending on soil pH	4 months	4 to 8 months*
Clarity	dicamba	anytime	21 days per 8 fl oz applied*	15 days after 8 fl oz rate*	14 to 28 days*	22 days per 8 fl oz applied
Corvus	thiencarbazone-methyl + isoxaflutole	anytime	10 months*	17 months*	9 months*	4 months
Degree Xtra	acetochlor + atrazine	**	**	**	**	4 months
DiFlexx	dicamba	anytime	60 days	60 days	30 to 60 days*	60 days
DiFlexx DUO	dicamba + tembotrione	anytime	10 months	10 months	8 months	4 months
Diuron 4L	diuron	next season	next season	next season	1 year	1 year
Dual II Magnum	S-metolachlor	anytime	anytime	anytime, with safened seed	anytime	4.5 months
ETX	pyraflufen-ethyl	anytime	anytime	1 day	anytime	anytime
Evik DF	ametryn	**	11 months	11 months	11 months	3 months

Table 5 continued. Rotational restrictions.

Product Name	Active ingredient(s)	Corn	Cotton	Grain Sorghum	Soybean	Wheat
Expert	atrazine + S-metolachlor + glyphosate	anytime	next season*	anytime, with safened seed	next season*	**
Firstshot SG	thifensulfuron-methyl + tribenuron-methyl	14 days	14 days	14 days	3 to 7 days*	anytime
Glyphosate products	glyphosate	anytime	anytime	anytime	anytime	anytime
Gramoxone SL	paraquat	anytime	anytime	anytime	anytime	anytime
Guardsman Max	dimethenamid-P + atrazine	anytime	next season	anytime, with safened seed	next season	**
Halex GT	S-metolachlor + glyphosate + mesotrione	anytime	10 months	anytime	10 months	4.5 months
Harmony SG	thifensulfuron-methyl	anytime	7 days	anytime	anytime	anytime
Hornet WDG	clopyralid + flumetsulam	anytime	18 months	12 months	10.5 months*	4 months
Keystone NXT	acetochlor + atrazine	anytime	next season*	next season	next season*	4 months
Kochiavore	2,4-D + bromoxynil + fluroxypyr	30 days	120 days	30 days	120 days	120 days
Latigo	dicamba + 2,4-D	7 to 30 days*	21 to 30 days*	14 to 30 days*	15 to 45 days*	14 to 21 days*
Laudis	tembotrione	anytime	10 months	10 months	8 months	4 months
LeadOff	rimsulfuron + thifensulfuron-methyl	anytime	1 to 18 months*	10 months	1 to 10 months	3 months
Lexar	S-metolachlor + atrazine + mesotrione	anytime	next season*	anytime, with safened seed	next season*	next year
Liberty 280 SL	glufosinate-ammonium	anytime	anytime	180 days	anytime	70 days
Lightning	imazethapyr + imazapyr	8.5 months, unless Clearfield	18 months	18 months	9 months	4 months
Linex 4L	linuron	anytime	4 months	anytime	anytime	4 months
Lumax	S-metolachlor + atrazine + mesotrione	anytime	next season*	anytime, with safened seed	next season*	next year
Northstar	dicamba + primisulfuron	14 days	8 months	8 months	8 months	3 months
Optill	saflufenacil + imazethapyr	8.5 months, unless Clearfield	18 months	18 months	0 to 1 month*	4 months
Outlook	dimethenamid-P	anytime	next season	anytime, with safened seed	anytime	4 months
Panther D	flumioxazin + 2,4-D	7 to 30 days*	30 days*	30 days	15 days*	30 days
Peak	prosulfuron	1 month	10 to 18 months*	1 month	10 to 18 months*	anytime
Permit	halosulfuron	1 month	4 months	2 months	9 months*	2 months
Prowl H_2O	pendimethalin	anytime	anytime	10 to 20 months*	anytime	4 months
Prequel	rimsulfuron + isoxaflutole	anytime	10 months*	10 months	10 months	4 months

Table 5 continued. Rotational restrictions.

Product Name	Active ingredient(s)	Corn	Cotton	Grain Sorghum	Soybean	Wheat
Realm Q	rimsulfuron + mesotrione	anytime	10 months*	10 months*	10 months	4 months
Resicore	acetochlor + mesotrione + clopyralid	anytime	18 months	10.5 months	10.5 months	4 months
Resolve SG	rimsulfuron					
Resolve Q	rimsulfuron + thifensulfuron-methyl	anytime	1 to 18 months*	10 to 18 months*	10 months	3 months
Resource	flumiclorac	anytime	30 days	30 days	anytime	30 days
Sharpen	saflufenacil	anytime	1.5 to 6 months*	anytime	0 to 4 months*	anytime
Solstice	fluthiacet-methyl + mesotrione	anytime	10 months	following corn harvest	10 months	4 months
Spirit	prosulfuron + primisulfuron-methyl	4 weeks	10 months*	10 months*	10 months*	3 months
Starane NXT	fluroxypyr + bromoxynil	30 days	120 days	30 days	120 days	30 days
Starane Ultra	fluroxypyr	anytime	120 days	anytime	120 days	**
Status	dicamba	7 days	30 days*	30 days*	30 days*	30 days*
Steadfast, Steadfast Q	nicosulfuron + rimsulfuron	anytime	10 months	10 to 18 months*	15 days	4 months
Stinger	clopyralid	anytime	18 months*	12 months	12-18 months*	anytime
Stout	nicosulfuron + thifensulfuron-methyl	anytime	10 months	10 to 18 months	15 days	4 months
SureStart, TripleFLEX	acetochlor + flumetsulam + clopyralid	anytime	26 months	12 months	next spring	4 months
Treflan 4 EC	trifluralin	12 to 18 months*	anytime	12 to 18 months*	anytime	12 to 18 months*
Valor SX	flumioxazin	up to 4 months*	up to 4 months*	up to 4 months*	up to 4 months*	up to 4 months*
Verdict	saflufenacil + dimethenamid-P	anytime	next season	anytime, with safened seed	1 to 4 months	4 months
Warrant	acetochlor	anytime	anytime	anytime, with safened seed	anytime	4 months
Widematch	clopyralid + fluroxypyr	anytime	18 months	12 months	12 months	anytime
Yukon	dicamba + halosulfuron	1 month	4 months	2 months	9 months	2 months
Zemax	S-metolachlor + mesotrione	anytime	next season	anytime	next season	4.5 months
Zidua	pyroxasulfone	anytime	1 to 4 months*	6 to 12 months*	0 to 4 months*	1 to 6 months*

*additional details specified, please refer to label

**rotation not specified on label, please refer to local Extension experts or company representatives for guidance

GUIDELINES FOR APPLYING ATRAZINE-CONTAINING PRODUCTS

1. **For all areas outside of the Gulf Coast, please consult Extension specialists or local chemical company representatives prior to applying atrazine.**

2. **For all soil applications prior to crop emergence**

   On highly erodible soils (as defined by the Natural Resources Conservation Service)

   If conservation tillage is practiced, leaving at least 30% of the soil covered with plant residues at planting, apply a maximum of 2.0 lb a.i./A atrazine as a broadcast spray. If the soil coverage with plant residue is less than 30% at planting, a maximum of 1.6 lb a.i./A may be applied.

   On soils not highly erodible

   Apply 2.0 lb a.i./A atrazine as a broadcast spray.

3. **For postemergence applications**

   If no atrazine was applied prior to corn emergence, apply a maximum of 2.0 lb a.i./A atrazine broadcast. If a postemergence treatment is required following an earlier atrazine application, the total atrazine applied may not exceed 2.5 lb a.i./A per calendar year.

ABBREVIATIONS:

COC – Crop oil concentrate
MSO – Methylated seed oil
NIS – Nonionic surfactant
HSOC – High surfactant oil concentrate
UAN – Urea ammonium nitrate
AMS – Ammonium sulfate

PHOTOGRAPHS OF COMMON WEEDS

Balloonvine
Cardiospermum halicacabum

Annual vine sprawling and trailing. Leaves alternate, usually twice ternately compound. Leaflets toothed and lobed. Flowers about 4 mm long with 4 petals. Fruits inflated (balloon-like).

Barnyardgrass
Echinochloa crus-galli

Annual summer grass. Leaf sheath and blade hairless with no ligule or auricles. Stems flattened. Spikelets 3 to 4 mm long.

Bindweed, field
Convolvulus arvensis

Perennial trailing vine with deep root. Gray-green pubescence. Simple, alternate leaves, usually lanceolate in shape. Flowers typically white with five petals.

Browntop Panicum
Urochloa fasciculatum

Annual summer grass. Spreading or erect growth forms possible. Ligules of hairs approximately 1 mm long. Panicles with appressed branches.

Common cocklebur
Xanthium strumarium

Summer annual. Smooth, waxy cotyledons lanceolate in shape. Alternate leaves triangular or ovate in shape with a rough, sandpaper texture.

Common sunflower
Helianthus annuus

Summer annual. Ovate cotyledons. Alternate simple leaves with rough texture and hairs. Leaves with serrate margins tapered to a point.

Cutleaf groundcherry
Physalis angulate

Summer annual. Mostly without hairs. Leaves ovate to ovate-lanceolate with toothed margins. Pale yellow flowers 5-sided. Stem angled in cross-section and hollow.

Devil's claw
Proboscidea louisianica

Low, bushy summer annual. Odiferous and covered with glandular hairs. Leaves alternate or opposite and mostly ovate in shape. Yellow five-lobed flowers. Fruit a fleshy curved pod, splitting into two "claws" after desiccation.

Hophornbeam copperleaf
Acalypha ostryifolia

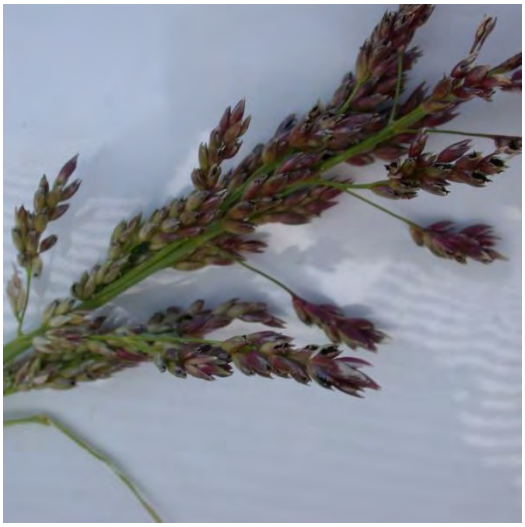
Erect annual, freely branched. Long-petioled leaves, nearly glabrous. Leaves alternate with finely toothed margins.

Horseweed
Conyza canadensis

Winter or summer annual. Smooth, spatulate cotyledons. Early leaves with entire margins, later leaves crowded around the stem with entire or toothed margins and often hairy.

Johnsongrass
Sorghum halepense

Perennial grass. Leaf sheath and blade hairless with no auricles. Large membranous ligules with jagged margins. Oval, shiny seed. May also reproduce via rhizomes.



Junglerice
Echinochloa colona

Summer annual grass. Very similar in appearance to *E. crus-galli* (barnyardgrass). Leaves may exhibit several purple bands across them.

Kochia
Kochia scoparia

Summer annual. Narrow, oblong cotyledons with many soft, fine hairs. Leaves alternate and simple with many hairs, and without petioles.

Morningglory spp.
Ipomoea spp.

Ipomoea hederacea (ivyleaf morningglory pictured). Trailing, twining annual or perennial vines. Mostly flowering in summer and fall. Leaves petioled, various shapes, often chordate at the base. Several species common to Texas.

Nutsedge, yellow
Cyperus esculentus

Perennial, colonial sedge. Stems triangular in cross-section. Leaves arranged in ranks of three and gradually form a pointed tip. Rhizomes sometimes with tubers forming at the ends.

Nutsedge, purple
Cyperus rotundus

Perennial, colonial sedge. Stems triangular in cross-section. Leaves arranged in ranks of three and form a more rounded tip than *C. esculentus* (yellow nutsedge). Rhizomes may form chains of tubers along their length.

Palmer amaranth
Amaranthus palmeri

Dioecious summer annual. Cotyledons linear and without hairs. Leaves mostly glabrous. Petioles often longer than leaf blades. Faint white chevron markings may be present on leaves.

Parthenium ragweed
Parthenium hysterophorus

Annual broadleaf resembling the appearance of ragweed. Seedling forms a basal rosette, which later grows to 0.5 – 1.5 m tall. Stems longitudinally grooved with stiff hairs. Later leaves are alternate and deeply divided. Flowers are white and form in numerous clusters.

Purslane, common
Portulaca oleracea

Sprawling summer annual. Cotyledons linear and without hairs. Opposite leaves which are smooth and spatulate. Leaves and stems are succulent.

Prostrate Spurge
Chamaesyce prostrata

Sprawling, prostrate annual. Leaf blades broadly elliptic, with short or no petioles, and arranged opposite. Leaves folding together at night or under poor conditions. Broken tissue exudes a milky sap.

Texas panicum
Urochloa texana

Annual grass, spreading to erect in growth habit. Ligules of hairs approximately 1 mm long. Broad, hairy leaves. Panicles with appressed branches. Similar in appearance to *U. fasciculate* (browntop panicum), except for slightly shorter pubescence of leaves.

Waterhemp, common
Amaranthus rudis

Summer annual. Linear cotyledons. Leaves narrowly ovate to lanceolate, alternate, and waxy in appearance. Plant without hairs. Petioles may be shorter than leaves.

Velvetleaf
Abutilon theophrasti

Summer annual. Each cotyledon differs in shape; one is ovate, while the other is chordate (heart-shaped). Both cotyledons with entire margins and covered in short hairs. Stems are densely hairy. Leaves chordate, and alternate with soft, velvety hairy surfaces.