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Weed Control in Oilseed Crops: 2011

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WEED CONTROL

in Oilseed Crops: 2011

Sunflower, Safflower, Canola, and Flax



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Herbicide Suggestions

Information in this publication is based on South Dakota Agricultural Experiment Station research and other research or observations. Herbicides are included only after the chemical is registered by the Environmental Protection Agency (EPA) as to residue tolerances in crops used for food or feed.

The information provides a summary of uses and does not imply a guarantee. The label is considered the final guide.

RATE. Rates for most herbicides are listed as product per acre. Product rates for glyphosate and bromoxynil are based on acid equivalent (ae) per acre.

HERBICIDE COST. The cost per acre for low and high rates of most common formulations is listed. Cost of additives is not included. Consult your dealer for actual price.

TIME to APPLY.

EPPS=Early Preplant Surface: before planting; not incorporated for no-till.

PPI=Preplant Incorporated: before the crop is planted; incorporated as directed.

PRE=Preemergence: after planting, but before crop or weeds emerge.

POST=Postemergence: after the crop or weeds have emerged.

RESISTANCE MANAGEMENT:

Refer to table on page 14 for a brief description of each herbicide site of action. Repeated use of similar herbicide modes of action over multiple years may result in herbicide resistant weed populations or shifts in populations toward weed species that are difficult or costly to control. Maintaining the efficacy of herbicide chemistries through herbicide rotations may be an effective long-term strategy to reduce weed control costs as herbicide patents expire and weed control technology becomes less expensive.

To facilitate proper herbicide rotation, the herbicide site of action number is listed next to the herbicide products in this publication.

Abbreviations

pt = pint
qt = quart
oz = ounce
gal = gallon
lb = pound
ai = active ingredient
ae = acid equivalent
gpa = gallon per acre
G = granule
L = liquid, flowable, EC
DF, DG = dry flowable
N = liquid nitrogen fertilizer
NIS = non-ionic surfactant
COC = crop oil concentrate
AMS = ammonium sulfate
in = inch

Safety First

Follow the Label. It is a violation of federal pesticide laws to use an herbicide in a manner inconsistent with its labeling. Read the entire label for using.

Applicator Safety. The most serious risk of exposure is during handling and mixing the concentrated product. Use protective equipment specified on the label. Use chemical resistant gloves, eye shield, long-sleeved clothing, rubber boots, and appropriate respirator as required. In case of emergency, contact the Poison Control Center via 24 hour phone line:

Poison Control Center – 1-800-222-1222

Water Protection. Water quality is a public concern. Preventing spills and accidents reduces risk of groundwater and surface water contamination. Mix herbicides away from wells and water sources. Prevent back siphoning. Install anti-backflow devices in irrigation equipment used for pesticides. Triple rinse containers. Store herbicides properly. Identify high-risk areas such as coarse soils or areas where the water table is near the surface. Be aware of herbicide properties that increase the risk of contamination in the critical area. Some treatments have specific restrictions requiring buffer strips and border areas around wells, lakes, and streams.

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Trade names for herbicides are used in this publication to aid reader recognition. The common name is also listed and is used for herbicides that are available in many labeled products. Examples of other product names are listed where possible based on information available. As patents expire and marketing agreements are formed, additional products may be marketed. Be sure crop use and application directions are followed for the product being used.

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The direct PDF download is at http://pubstorage.sdstate.edu/AgBio_Publications/articles/FS525OS.pdf.



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Sunflower Herbicides

Weeds may reduce sunflower yield even though the infestation is not visually dramatic. The most serious loss from annual weed competition occurs during the first 4 weeks after crop emergence. Herbicides used in sunflowers are not effective on perennials.

1. Destroy the first weed flush just before planting with tillage or burndown herbicide. Plant immediately after tillage. Rotary hoe or harrow on a warm, clear day will control seedling weeds. Delay harrowing until sunflowers have four leaves. Increase planting rate 10 to 15% to compensate for stand reduction due to harrowing. A firm seedbed reduces stand loss from harrowing. Row cultivation or postemergence herbicides controls weeds into the season.
2. Residue in equipment or drift from application in nearby fields can cause injury. Sunflowers are highly sensitive to herbicides such as 2,4-D, picloram, dicamba, MCPA, Ally, Amber, and other similar herbicides. Use caution to prevent droplet or vapor drift to the sunflower crop when spraying nearby pastures, small grain, or row crops.
3. Carryover of herbicides used the previous season may injure sunflowers. Refer to Table 1 for rotation intervals for sunflowers planted the season following herbicide use.

No-Till Sunflowers

Weed control programs for sunflowers are limited. Evaluate herbicide options for anticipated weed problems. Avoid fields with a heavy weed history or where perennials are a problem. Annual broadleaf weeds can be serious; there are no postemergence herbicides for these weeds after the crop emerges. Planting full population in narrow rows effectively reduces late season weed problems. Weeds often develop in areas where the stand is open or not uniform.

Gramoxone or glyphosate is used to burn down emerged grasses and broadleaves at planting. Prowl may be used as a surface, early preplant treatment primarily for foxtail control. Poast, Select, or Prism is approved for postemergence grass control. Spartan has provided very good results in no-till sunflowers. Beyond used in Clearfield sunflower provides postemergence control of several annual broadleaves and some grasses. For reduced tillage systems, trifluralin granules fit where residue management is important during the most critical periods. Refer to the section for each herbicide.

Experimental use of trifluralin (Treflan) or ethalfluralin (Sonalan) granules as a fall or early spring surface application has been evaluated. Granules have been more effective than sprays when used in this manner. Results in some tests have been satisfactory; however, weed control is less consistent than for incorporated applications. This approach may be satisfactory for fields with light weed pressure and in season when rainfall provides early herbicide activation. Labeling is not anticipated.

Safflower Herbicides

Consider the potential weed problems based on recent weed history. Evaluate the control of potential problems with the limited herbicides available. Early-season control of annuals such as kochia, Russian thistle, and foxtail is important in safflower.

Safflower is not tolerant to some herbicides used in other crops; residue tolerances have been set only for crops listed on the label. It is illegal to use unlabeled herbicides on the crop.

Carryover of herbicides used the previous season may injure safflower. Refer to Table 1 for rotation intervals for safflower planted the season following herbicide use.

Canola Herbicides

Canola and other mustard related plants are sensitive to carryover and drift from several herbicides. Refer to Table 1 for rotation intervals for canola planted the season following herbicide use. Drift from herbicides used to control mustard and other broadleaf weeds can also cause damage. Some labels may have extended planting restriction until there is sufficient data to reduce the application to planting interval for canola.

TREFLAN or TRIFLURALIN (trifluralin) *Site of Action:* 3**(\$3.00-9.65)****1-2 pt trifluralin 4L or 5-10 lb Treflan 10G (0.5-1 lb ai)**

Excellent control of most annual grasses and fair control of small-seeded annual broadleaves such as pigweed and lambsquarters. Higher rates give fair kochia control. Wild oat control is not consistent but has been fair in some tests. Does not control wild mustard, wild sunflower, or cocklebur. Excellent crop tolerance. Rate of 1.5 pt 4L has been satisfactory in most SDSU tests. Carryover may damage oats or sorghum the following year. Granules or spray may be applied in the fall after October 15 or in the spring before planting. Fall application makes it possible to limit spring tillage to a single pass which serves as the second incorporation. Minimum carrier is 5 gpa for ground or air.

Spray Formulations: Immediate incorporation preferred, but may be delayed up to 24 hours if soil surface is dry and wind is under 10 mph. Incorporate into the top 2 to 3 inches. A second incorporation improves uniformity, especially under wet, lumpy, or trashy conditions. Follow with a harrow or leveling device. A tandem disk followed by a field cultivator provides good incorporation under a variety of conditions.

Granules: Preferred for fall application. Incorporate within 24 hours. May be applied in standing stubble. A chisel with sweeps may be used for the first incorporation. A few days delay between incorporations is suggested. Fall-applied granules are especially useful in reduce tillage systems designed to maintain residue in the fall and early spring. Crop residue interferes less with granules than with spray.

SUNFLOWER: *PPI SPRING or FALL.* Treflan 4L rate is 1 – 1.5 pt/A on coarse to medium texture soil or 1.5 – 2 pt/A on fine texture soil. Granule TR-10 rate is 5 – 10 lb/A.

SAFFLOWER: *PPI SPRING or FALL.* Treflan 4L rate is 1 – 1.5 pt/A on coarse to medium texture soil or 1.5 – 2 pt/A on fine texture soil. May increase the rate by 0.5 pt/A when applying in fall. Granule TR-10 rate is 5 – 12.5 lb/A.

CANOLA: *PPI SPRING or FALL.* Treflan 4L rate is 1 pt/A for coarse, 1.5 pt/A for medium, and 2 pt/A for fine texture soil. Granule TR-10 rate is 5 – 10 lb/A.

FLAX: *FALL.* Treflan 4L rate is 1 pt/A for coarse, 1.5 pt/A for medium, and 2 pt/A for fine texture soil. Spring tillage should be relatively shallow. Granule TR-10 rate is 5 – 10 lb/A.

PROWL (pendimethalin) *Site of Action:* 3**(\$5.55-16.65)****1.2-3.6 pt Prowl or Pendimax 3.3L (0.5-1.5 lb ai)****2-3 pt Prowl H₂O 3.8L (0.9-1.5 lb ai)**

Additional 3.3L products include Acumen, Pendant, Pendimax, and Stealth. Very good to excellent control of most annual grasses and fair control of small-seeded broadleaves such as pigweed and lambsquarters. Consistent performance. Does not control wild mustard, wild sunflower, or cocklebur. Excellent crop tolerance. Minimum carrier is 5 gpa for air or 10 gpa for ground. No label restrictions for crops planted the following year; however, below normal precipitation during the previous year increases carryover risk to sensitive crops. Do not plant winter wheat in the fall if the sunflower crop failed due to dry weather. Prowl H₂O is a new water-based formulation that has performed well in higher residue and causes less staining.

SUNFLOWER:

EPPS. For no-till. Apply up to 30 days before to immediately after planting. Primarily for foxtail; control of lambsquarters and pigweed is more consistent than for other broadleaves. Rates are 2.6 to 3.6 pt of 3.3L or 3 pt of 3.8L per acre. Use the high rate for most soils. Use 20 to 60 gpa carrier. May be tank-mixed with Gramoxone or glyphosate for burndown. Do not plant no-till wheat in the fall following the use of no-till Prowl in the spring.

PPI SPRING. Apply up to 60 days after planting. Rates are 1.2 to 3.6 pt 3.3L or 2-3 pt of 3.8L per acre. The 3 pt per acre rate has been satisfactory in most SDSU tests. Incorporate within 7 days. Immediate incorporation preferred. Incorporate into the top 1 to 2 inches. Till in crop residue before application. Single-pass incorporation may be adequate if seedbed has been well prepared. Double incorporation insures uniform mixing.

PPI FALL. Apply in late fall when soil temperature is below 45° F. but before the soil freezes. Incorporate immediately. Use at least one shallow tillage incorporation in the spring before planting. Rates are 1.8 to 4.2 pt of 3.3L or 2.5 to 3.5 pt of 3.8L per acre. Higher rates (3-3.5 pt) are suggested for fall.

SONALAN (ethalfluralin) Site of Action: 3**(\$6.80-15.10)****1.5 – 4.5 pt Sonalan HFP 3L or 5.5 - 17 lb Sonalan 10G (0.55-1.2 lb ai)**

Excellent control of most annual grasses and fair to good control of small-seeded broadleaves such as pigweed and lambsquarters. Consistent performance. Does not control wild sunflower, cocklebur, or wild mustard. Gives fair wild oat control. Excellent crop tolerance. Minimum carrier is 5 gpa. Less soil residual than Treflan; no label limitations for common crops for the following year. Do not graze or forage treated fields.

SUNFLOWER:

Sonalan 3L rate is 1.5 – 4.5 pt/A (5.5 – 17 lb/A of Sonalan 10G) depending on soil type and weed species. Rates are 1.5 – 3 pt/A (5.5 – 11.5 lb/A of 10G) for most weed species or 3 – 4.5 pt/A (11.5 – 17 lb/A of 10G) for groundcherry and nightshade. Rate of 3 pt of 3L (11.5 lb of 10G) per acre has been satisfactory in most SDSU tests.

PPI FALL. May be applied after October 1. Incorporate as soon as possible. Do not delay more than 2 days. Second incorporation of granules should be delayed at least 5 days.

PPI SPRING. Apply within 3 weeks before planting. Incorporate into the top 2 to 3 inches. Immediate incorporation preferred; however, incorporation may be delayed up to 2 days. Second pass may improve uniformity. Delay second incorporation of granules 3 to 5 days.

SAFFLOWER:

Sonalan 3L rate is 1.5 – 2 pt/A (5.5 – 7.5 lb/A of 10G) on coarse, 2 – 2.5 pt/A (7.5 – 9.5 of 10G) on medium, or 2.5 – 3 pt/A (9.5 – 11.5 lb/A) on fine texture soils.

PPI FALL or **PPI SPRING.** Follow instructions as described for sunflower.

CANOLA:

Rate is 1.5 pt/A on coarse, 2 pt/A on medium, and 2.5 pt/A on fine soil.

PPI FALL or **PPI SPRING.** Follow instructions as described for sunflower.

EPTAM (EPTC) Site of Action: 8**(\$14.45-20.20)****2.5 - 3.5 pt Eptam 7L (2.2-3 lb ai)**

Excellent control of most annual grasses. Good control of wild oats in most tests. Annual broadleaf control limited. Does not control wild sunflower, wild mustard, kochia, or Russian thistle. Consistent results. Good crop tolerance on medium and heavy soils. Not suggested for light, sandy soil. Minimum carrier is 10 gpa. There is no carryover to following crops. Incorporate immediately into the top 2 to 3 inches. A second incorporation insures uniformity, especially in wet, lumpy, or trashy conditions. Follow with harrow or other leveling devices.

SUNFLOWER: PPI. Eptam 7L rate is 2.5 – 3.5 pt/A. Apply and incorporate just before planting.

SAFFLOWER: PPI. Eptam 7L rate is 3.5 pt/A or the 20G rate is 15 lb/A. Apply and incorporate just before planting.

SUNFLOWER TANK-MIXES**2.25 pt Eptam 7L + 1-2 pt trifluralin 4L (2+0.5-1 lb ai)****(\$16.40-19.80)****2.5-3.5 pt Eptam 7L + 1.25-3 pt Sonalan 3L (2.2-3 + 0.66-1.1 lb ai)****(\$20.10-33.80)**

Excellent control of several annual grasses. Tank-mixes appear to have limited advantage for most weed problems when compared to the full rate of each herbicide used alone. Very good to excellent wild oat control than for trifluralin or Sonalan alone. Lower trifluralin rates reduce carryover for sensitive crops. Rates of Eptam at 2.5 pt plus 2 pt Sonalan or Eptam at 2.25 plus 1 to 1.5 pt trifluralin 4L per acre are adequate for most situations. Minimum carrier is 10 gpa. Note carryover restrictions for trifluralin.

PPI. Incorporate immediately as for Eptam alone.

SPARTAN (sulfentrazone) Site of Action: 14**(\$13.75-36.70)****3-8 oz Spartan 4F (0.09-0.25 lb ai)**

Spartan is a soil-applied herbicide with root and shoot activity. Spartan is used primarily for annual broadleaf weeds including pigweed, normal and ALS resistant kochia, and black nightshade. Fair to good control of wild buckwheat and lambsquarters is possible under favorable conditions. Activity on biennial wormwood has been reported.

Rates varies with soil texture. Use 3.75-6.0 oz/A for most soil s (O.M. 1-3%). SDSU trials often based on 6 oz/A rate. Lowest rate is for coarse to moderate texture soil with less than 1% O.M. The high rate is suggested for heavy soil, especially if applied considerably before planting. Crop tolerance has been satisfactory in SDSU tests. Do not use on soil with less than 1% O.M. Failure to adequately close the seed furrow may result in crop injury.

Application is limited to use in conservation tillage systems. Minimum carrier is 10 gpa for ground equipment.

SUNFLOWER:

FALL. Spartan labeling includes application as a burndown with residual in late summer, fall, or early spring prior to planting labeled crops. Do not apply to frozen soil. Use mid to high rates for the appropriate soil type. Fall/spring split applications have performed very well.

EPPS. Use high rate for appropriate soil type for applications more than 3 weeks prior to planting. Add COC to improve burndown on small broadleaf weeds. Add Roundup to control emerged grass, larger weeds or perennials weeds.

PRE. Rainfall required before weed emergence. Apply within 3 days after planting.

SUNFLOWER TANK-MIXES

Spartan may be tank-mixed with Prowl or Pendimax or other soil applied herbicides for added residual control or with burndown herbicides to control emerged weeds.

SUNFLOWER PREMIX**SPARTAN ADVANCE (sulfentrazone + glyphosate) Site of Action: 14+9 (\$15.50-42.10)****21-57 fl oz Spartan Advance (0.09-0.25 lbs ai + 0.5-1.3 lbs ae)**

Rates vary by soil texture, organic matter (O.M.), and pH. Spartan Advance at 33 fl oz/A contains the equivalent active ingredients as Spartan 4F at 4.6 fl oz/A and Roundup WeatherMax at 22 oz/A. Therefore, rates less than 32 oz/A may require additional glyphosate to control emerged weeds.

SUNFLOWER:

FALL. Do not mechanically incorporate. Do not apply to frozen or snow-covered soil. Use mid to high rates appropriate for the soil texture and O.M.

EPPS or PRE. For applications earlier than 3 weeks prior to planting, use the high rate appropriate for the soil texture and O.M. Weed control may be reduced if 0.5-1 in of precipitation is not received within 7-10 days after application. On coarse texture soils, it is recommended to apply 7-14 days prior to planting. Risk of injury is greatest on coarse soils with less than 1.5% O.M. and pH is 7.8 or greater. Reduce rates or avoid application on high risk soils. Crop stress may also increase the risk of crop injury.

SPARTAN CHARGE (sulfentrazone + carfentrazone) Site of Action: 14+14 (\$13.40-36.50)**3.75-10.2 fl oz Spartan Charge (0.09-0.25 + 0.01-0.03 lbs ai)**

Rates vary by soil texture, organic matter (O.M.), and soil pH. Spartan Charge is 5.5 fl oz/A containing the equivalent active ingredients as Spartan 4F at 4.3 fl oz/A and Aim 1.9EW at 1 oz/A. Thorough coverage is important for foliar weed control. May be tank-mixed with glyphosate, glufosinate, or paraquat. Do not apply on soils classified as sand with less than 1% O.M.

SUNFLOWER:

FALL. Do not mechanically incorporate. Do not apply to frozen or snow-covered soil. Use mid to high rates appropriate for the soil texture and O.M.

EPPS or PRE. For applications earlier than 3 weeks prior to planting, use the high rate appropriate for the soil texture and O.M. Try to minimize soil disturbance if planting after application. Weed control may be reduced if 0.5-1 in of precipitation is not received within 7-14 days prior to planting. Risk of injury is greatest on coarse soils with less than 1.5% O.M. and pH is 7.8 or greater. Reduce rates or avoid application on high risk soils. Crop stress may also increase the risk of crop injury.

DUAL MAGNUM, BRAWL, CHARGER BASIC, CINCH, MEDAL

(s-metolachlor) *Site of Action: 15*

(\$14.20-28.35)

1 – 2 pt Dual Magnum, Brawl, Charger Basic, Medal 7.62L (0.95 - 1.9 lb ai)

1 – 2 pt Dual II Magnum, Brawl II, Charger Max, Cinch, Medal II 7.64L (0.95 - 1.9 lb ai)

Dual is used primarily for annual grass control. Results on foxtail have been fair to excellent, depending on timeliness of rainfall. Provides limited activity on broadleaves such as pigweed. Crop tolerance in SDSU tests has been excellent. Rates of 1.5 to 2 pt per acre have been satisfactory in SDSU tests. Minimum carrier is 5 to 10 gpa for ground or 2 gpa for air. Do not allow livestock to graze or feed in treated areas.

SUNFLOWER:

Only some of the 7.62L products, such as Dual (not Dual II), Brawl, and Charger Basic are registered for use in sunflower.

PPI. Incorporate shallowly into the top 2 inches. Avoid deep or uneven incorporation. Early application followed by a burndown at planting gives more consistent results in no-till because the chance of getting adequate rainfall for incorporation is greater earlier in the spring.

PRE. Apply after planting but before crop or weed emergence.

SAFFLOWER:

PPI or PRE. Follow directions as described for sunflower. **Stalwart** and **Parallel** (1 – 2 pt/A) are metolachlor (not s-metolachlor) products labeled for use in safflower. S-metolachlor is generally considered to be a more active isomer of metolachlor, but SDSU trials have demonstrated that weed control is often similar between metolachlor and s-metolachlor products.

PREMIX

SEQUENCE (s-metolachlor + glyphosate) *Site of Action: 15+9*

2.5 – 2.75 pt/A Sequence (0.7 – 0.8 lbs ae glyphosate + 0.94 – 1.03 lbs ai s-metolachlor)

For foliar activity on many weed species and residual activity on annual grass weed species. Control may be best if weeds are less than 6 inches tall. May add AMS (8.5 – 17 lbs/100 gallons spray solution) to improve weed control. Carrier rate should be 10 – 40 gpa for ground applications or 3 – 15 gpa for aerial applications.

SUNFLOWER:

PPS or PRE. Apply before, during, or immediately after planting but prior to crop emergence. Do not apply more than 2.5 – 2.75 pt/A per year. May tank mix with Eptam, Prowl, or trifluralin (e.g. Treflan).

MICRO-TECH (alachlor) *Site of Action: 15*

2 – 4 qt Micro-Tech (2 – 4 lb ai)

For residual control of many annual grass weed species and some broadleaf weed species, such as waterhemp. Does not have foliar activity on weed species. Use high rates for dense weed infestations. Do not make more than one application or apply more than 4 qt/A per year. Do not graze treated areas or feed treated foliage to livestock. About 1/3 – 3/4 inch of precipitation is required within 1 week after application to properly incorporate the herbicide in to the soil.

SUNFLOWER:

PPI: Apply within 7 days prior to planting and incorporate in the top 1 - 2 inches of soil. Rate is 2.5 qt/A on coarse, 3 – 3.5 qt/A on medium, or 3.5 – 4 qt/A on fine textured soils.

PRE: Apply after planting but prior to crop and weed emergence. Rate is 2 qt/A on coarse, 2.5 – 3 qt/A on medium, or 3 – 4 qt/A on fine textured soils.

POAST (sethoxydim) Site of Action: 1**(\$5.20-15.65)****0.5 - 2 pt Poast 1.5L (0.1 - 0.38 lb ai)**

Very good control of annual grass and suppression of quackgrass. Use 0.5 pt for wild proso millet (10 in); 0.75 pt for foxtail (4 in); 1 pt for foxtail (8 in) or wild oat (4 in); 1.2 pt for sandbur (3 in); and 1.5 pt for volunteer cereal (4 in) per acre. Results for quackgrass are best with a split application of 1.5 pt followed by 1 pt per acre with COC and 28% N or AMS.

Cultivation 7 days after application improves quackgrass control. Grasses should be actively growing. Do not cultivate 5 days before or 7 days after application. Minimum carrier is 5 gpa for ground or air. Minimum pressure is 40 psi for ground. Good coverage improves results.

Always add 1 qt per acre COC or 1 pt/A Dash HC or Sundance HC. Add AMS (2.5 lb/A) or UAN (2 – 4 qt/A) to improve control of volunteer cereal, wild oat, and quackgrass.

SUNFLOWER, SAFFLOWER, CANOLA: POST. Timing and rates based on weed species and weed height. Maximum application rate is 2.5 pt/A for most crops.

FLAX: POST. Maximum application rate is 2.5 pt/A for most crops, but it is 1.5 pt/A for flax. May tank mix with Bronate, Buctril, or MCPA. However, mixing with these herbicides may cause flax leaf burn and stunting. Do not add AMS or UAN when tank mixing with these broadleaf herbicides.

SELECT, VOLUNTEER, INTENSITY, SHADOW, SECTION, CLETHODIM, ARROW**(clethodim) Site of Action: 1****(\$9.30-24.80)****6-16 oz Select, Arrow, Clethodim, Volunteer, Intensity, Shadow, Section 2L (0.09-0.25 lb ai)
12-32 oz Select Max, Shadow Ultra, Intensity One, Tapout 1L (0.09-0.25 lb ai)**

Very good to excellent control of annual grasses. Provides quackgrass suppression. Grasses should be actively growing as control may decline during drought stress. Do not cultivate one week before or after application. Apply when annual weeds are 2 – 6 inches tall. Rates of 6 to 8 oz Select 2L or 12-16 oz Select Max per acre are for annual grasses and volunteer cereals, corn, and sorghum. Higher rates of 8 to 16 oz Select 2L or 16-32 oz Select Max are for controlling perennial grasses. Allow 14 days between applications if making more than one application per season.

Minimum carrier volume is 5 gpa (10 gpa for dense canopies and during drought stress) for ground applications or 3 gpa for aerial applications. Thorough coverage improves control.

SUNFLOWER:

Registered products include Select, Select Max, Arrow, Volunteer, Intensity, Intensity One, Shadow, Section, Tapout, and Clethodim.

POST. Rate of 1L products (Select Max) is 9 – 16 fl. oz/A for annual grasses and 12 – 32 fl. oz/A for perennial grasses. Rate of 2L products (Select) is 6 – 16 fl. oz/A. For Select Max, add NIS (0.25% v/v) or COC (1 qt/A or 1% v/v) or MSO (1 qt/A or 1% v/v), but for Select, always add COC at 1 qt/A for ground applications or 1% v/v but not less than 1 pt/A for aerial applications. May also add AMS at 2.5 – 4 lb/A. Preharvest interval is 70 days. Do not apply more than 64 fl. oz/A of 1L product (Select Max) or 32 fl. oz/A of 2L product (Select) per season.

SAFFLOWER:

Registered products include Select Max, Arrow, Intensity, Intensity One, Shadow, Section, Tapout, and Clethodim.

POST. Rate of 1L products (Select Max) is 9 – 16 fl. oz/A for annual grasses and 12 – 16 fl. oz/A for perennial grasses. Rate of 2L products (e.g. Shadow) is 6 – 8 fl. oz/A. For Select Max, add NIS at 0.25% v/v but add COC (1% v/v) with Select. Preharvest interval is 70 days. Do not apply more than 64 fl. oz/A of 1L product (Select Max) or 32 fl. oz/A of 2L product (e.g. Shadow) per season.

CANOLA:

Registered products include Select, Select Max, Arrow, Volunteer, Intensity, Intensity One, Shadow, Section, Tapout, and Clethodim.

POST. Rate of 1L products (Select Max) is 9 – 12 fl. oz/A for annual grasses and 12 fl. oz/A for perennial grasses. Rate of 2L products (Select) is 4 – 6 fl. oz/A. For Select Max, add NIS at 0.25% v/v but add COC (1% v/v) with Select. It is not necessary to add N fertilizer (e.g. AMS or UAN). Apply prior to canola bolting or bloom to prevent crop injury. Preharvest interval is 70 days. May tank mix Select Max with Liberty (for Liberty Link canola) or Stinger or tank mix Select with Liberty. Do not apply more than 12 fl. oz/A of 1L product (Select Max) or 16 fl. oz/A of 2L product (Select) per season.

SELECT, VOLUNTEER, INTENSITY, SHADOW, SECTION, CLETHODIM, ARROW (Continued . . .)

FLAX:

Registered products include Select, Select Max, Arrow, Volunteer, Intensity, Intensity One, Shadow, Section, Tapout, and Clethodim.

POST. Rate of 1L products (Select Max) is 9 – 16 fl. oz/A for annual grasses and 12 – 16 fl. oz/A for perennial grasses. Rate of 2L products (Select) is 6 – 8 fl. oz/A. For Select Max, add NIS at 0.25% v/v but add COC (1% v/v) with Select. It is not necessary to add N fertilizer (e.g. AMS or UAN). Apply prior to flax bloom to avoid flax injury. Preharvest interval is 60 days. May tank mix Select Max with Bronate Advanced, Bronate/Buctril, MCPA, or Curtail M. Do not apply more than 32 fl. oz/A of 1L product (Select Max) or 16 fl. oz/A of 2L product (Select) per season.

ASSURE II, Targa (quizalofop) *Site of Action: 1*

(\$4.70-13.70)

5-12 fl oz/A Assure II or Targa (0.03-0.08 lb ai)

Controls several annual grass weed species and suppresses quackgrass. Apply to young, actively growing grass weeds. Apply when annual grass weeds are 2-6 inches tall for most species. Check the label for rates based on the weed species present. Maximum use rate is 18 oz/A per year. For repeated applications, allow at least 7 days between applications. Do not cultivate one week before or after application. Do not apply if rainfall is expected within 1 hour of application. Do not graze or feed treated foliage to livestock.

Apply 6 oz/A for volunteer corn and proso millet, 8 oz/A for other annual grasses, and 10 oz/A for quackgrass. See label for specific rates for specific species.

Add NIS at 0.25% v/v (1 qt/100 gal) or COC (1% v/v or 1 gallon per 100 gallons of spray solution). For aerial applications, COC may be applied at 0.5% v/v or 2 qt per 100 gallons spray solution. UAN (28 or 32% N) at 2 qt/A or AMS at 2 lb/A may be added in addition to NIS. Minimum carrier is 10 gpa for ground applications or 3 gpa for aerial applications. Increase carrier rate by 50% in dry areas. Weed control may decline if applied during drought stress.

SUNFLOWER: POST: Do not apply within 60 days of harvest. Avoid application if sunflowers are stressed. Maximum use rate is 18 oz per year.

CANOLA: POST: Do not apply within 60 days of harvest. Maximum use rate is 18 oz per year.

FLAX: POST: Do not apply within 70 days of harvest. Maximum use rate is 24 oz per year.

ASSERT (imazamethabenz) *Site of Action: 2*

(\$5.90-11.80)

0.6-1.2 pt Assert 2.5L (0.2-0.4 lb ai)

Very good to excellent control of wild mustard and very good control of wild oat. Other grasses and most other broadleaves are not controlled. Excellent crop tolerance. Weed control is best under favorable growing conditions; some variability in wild oat control noted under drought stress. Rate varies according to weed species. Wheat, barley, corn, and potatoes may be planted the following season. Most other crops require 15 month interval. Do not use treated fields for forage. Minimum carrier is 5 gpa for air and 8 gpa for ground. Add 0.3 fl oz NIS or COC for each gallon of carrier in excess of 10. Maintain agitation during mixing and spraying.

POST. For wild mustard, apply 0.6 to 0.8 pt per acre when weeds are at seedling stage but before bloom. For wild oat, apply 1.2 pt per acre at the 1- to 4-leaf stage. Sunflowers should be under 15 inches.

GRAMOXONE 2L, FIRESTORM 3L, PARAZON 3L (paraquat) *Site of Action: 22*

2.5-4 pt Gramoxone Inteon 2L (0.5-1.0 lb ai)

(\$11.15-17.85)

SUNFLOWER, SAFFLOWER

BURNDOWN. Paraquat is a non-selective, contact herbicide used for burndown in no-till or reduced-tillage systems. No residual. Minimum carrier is 10 gpa for ground or 5 gpa for air. Add NIS at 1 to 2 pt or COC at 1 gal/100 gal for ground. Use NIS at 2 pt or COC at 1 pt/100 gal for air. Follow handling precautions. Paraquat is highly toxic if ingested.

GRAMOXONE 2L, FIRESTORM 3L, PARAZON 3L (continued . . .)

1.2-2.0 pt Gramoxone Inteon 2L (0.3-0.5 lb ai)

(\$5.35-8.95)

SUNFLOWER:

HARVEST AID. Desiccant for oil seed and confection varieties. Provides more rapid drying in late, wet fall or to hasten drying of less mature plants within a field. Generally not necessary in normal seasons. Apply at physiological maturity, when the back side of the head is yellow, and bracts around the outer edge of the head are turning brown. This usually corresponds to seed moisture of 35% or less. Earlier application will reduce yield and test weight. Minimum carrier is 10 gpa for ground; 5 gpa for air. Add NIS at 1 to 2 pt or COC at 1 gal/100 gal for ground. Use NIS at 2 pt or COC at 1 pt/100 gal for air. Follow handling precautions. Paraquat is toxic if ingested. Allow 7 day application to harvest interval. Do not graze treated areas or feed treated forage to livestock. **Restricted Use Pesticide.**

GLYPHOSATE PRODUCTS (glyphosate) *Site of Action: 9*

Glyphosate is available in several products having different formulations and concentrations; **however only certain products are labeled for burndown in specific crops.** Products may be available in several concentrations, such as 3 lb ae (4 lb ai); 3.75 lb ae (5 lb ai); 4.17 lb ae; 4 lb ae (5.4 lb ai); 4.5 lb ae (5.5 lb ai), and 5 lb ae. Check specific product label.

16-32 oz glyphosate 3 lb ae (0.38-0.75 lb ae)	(\$1.40-2.75)
12-24 oz glyphosate 4 lb ae (0.38-0.75 lb ae)	(\$1.75-3.55)
12-23 oz glyphosate 4.17 lb ae (0.38-0.75 lb ae)	(\$1.30-3.55)
11-21 oz glyphosate 4.5 lb ae (0.38-0.75 lb ae)	(\$1.65-4.50)
10-19 oz glyphosate 5 lb ae (0.38-0.75 lb ae)	(\$1.55-2.95)

Glyphosate is a non-selective translocated herbicide with no soil residual activity. It controls both grasses and broadleaf species. It is used as a burndown for annual weeds or to suppress emerged perennials prior to crop emergence. Rates above are adequate for preplant burndown for small, susceptible annuals; the high rate for larger, mixed populations and for suppression of perennials. Carrier is 3 to 40 gpa for ground and 3 to 15 gpa for air. Maximum rate for air is 1 qt of 3 lb ae product. Adjust rates according to formulation.

SUNFLOWER, SAFFLOWER, CANOLA, FLAX:

BURNDOWN. Apply prior to planting or after planting but before crop emergence. Do not add 2,4-D or other non-labeled herbicides.

SUNFLOWER, SAFFLOWER:

PRE-HARVEST. Roundup WeatherMax, Roundup Original Max, and Roundup PowerMax are registered for pre-harvest applications. Apply no more than 22 oz/A. For sunflower, apply after sunflower plants are mature (seed less than 35% moisture and back of heads are turning yellow and the bracts are turning brown). For safflower, apply after the safflower seeds have lost their opaque color, which is approximately 20 – 30 days after the end of flowering on the secondary branches.

SUNFLOWER:

HOODED SPRAYER APPLICATION. Certain labeled glyphosate products allow use through hooded sprayers to control weeds between the rows. The spray unit must completely enclose the spray pattern. Spray particles that escape and contact the crop will cause damage. Maximum rate is 1 qt of 3 lb ae per acre. Sunflowers must be at least 12 inches tall; leave an 8-inch untreated strip over the row. Maximum tractor speed is 5 mph. This application is useful for weeds between the row; including perennials. However, a program to control early season weeds and weeds in the row is required to prevent early weed competition.

AIM (carfentrazone)

(\$3.45-13.80)

0.5-2 fl oz Aim 2EC or Aim 1.9EW (0.008-0.31 lb ai)

SUNFLOWER, FLAX:

BURNDOWN. Apply prior to planting up to 24 hours after planting. Most effective on small weeds less than 4 inches tall or rosettes less than 3 inches wide. Tank mix with glyphosate or paraquat for broad spectrum weed control.

SUNFLOWER:

HOODED SPRAYER APPLICATION. Apply 0.5 to 2 fl oz/A with rates depending on weed species. Avoid spray contact with sunflower foliage. Minimum carrier volume is 10 gpa. Do not travel faster than 5 mph. Use NIS (0.25% v/v), COC (1-2% v/v), or MSO (1-2% v/v) and either liquid nitrogen fertilizer (2-4% v/v) or AMS (2-4 lb/A).

SHARPEN (saflufenacil) Site of Action: 14 **(\$4.80-9.60)**

1-2 fl oz Sharpen (0.02-0.04 lb ai)

SUNFLOWER:

HARVEST AID. May be used only as a harvest aid/desiccant. Apply when sunflowers are mature which is the time when seed moisture is less than 36%. Maturity may be visually estimated as the time when the backs of the sunflower heads are yellow and the leafy bracts on the heads are beginning to turn brown. Apply at least 7 days prior to harvesting. May tank-mix with glyphosate for added weed control.

Add an MSO at 1% v/v (1 gallon per 100 gallons spray solution). Up to two applications may be made, but the cumulative amount applied cannot exceed 4 oz per season. Do not apply to sunflowers grown for seed.

DEFOL (sodium chlorate) **(\$6.50)**

3.2 qt Defol 7.5L (6 lb ai)

Harvest aid desiccant for oil seed or confectionary varieties. Useful to facilitate harvest when fall conditions are unfavorable. Also reduces bird damage associated with harvest delay. Contact action. Apply when crop is fully mature. Rate is 3.2 qt per acre. May add NIS or COC. Minimum carrier is 5 to 10 gpa for air or 20 to 30 gpa for ground.

SUNFLOWER, SAFFLOWER, FLAX:

HARVEST AID. Apply to mature heads at least 7 days before normal harvest. Treated fields cannot be grazed or used for forage for 14 days after treatment.

STINGER, GARRISON, SOLIX, and CLOPYR AG (clopyralid) Site of Action: 4(\$14.30-28.60)

0.25-0.5 pt Stinger, Garrison, Solix, or Clopyr AG 3L (0.09-0.18 lb ae)

CANOLA:

POST. Especially effective for Canada thistle; also control annual broadleaves such as sunflower. Use the high rate for Canada thistle. Apply when canola is in the 2 to 6 leaf growth stage. Do not apply within 50 days of harvest.

MCPA AMINE or MCPA ESTER Site of Action: 4 **(\$1.05-1.40)**

0.25 lb ae MCPA amine or MCPA ester (0.25 lb ae)

FLAX:

POST. Apply when flax is 2 to 6 inches tall but before buds form. Treat before weeds are 4 inches tall. Fair to good control of mustard and lambsquarters; poor on kochia or wild buckwheat. Fair to good crop tolerance. Avoid treating during drought stress. Flax may be underseeded to alfalfa. Not labeled for preharvest application.

BROMOXYNIL PRODUCTS (bromoxynil) Site of Action: 6 **(\$7.80-8.90)**

BROMOXYNIL + MCPA PRODUCTS (bromoxynil + MCPA) **(\$4.55-5.85)**

1 pt bromoxynil 2L or 0.5 pt bromoxynil 4L (0.25 lb ae)

0.9 pt bromoxynil/MCPA 4L or 0.72 pt Bronate Advanced 5L (0.2 + 0.2 lb ae)

FLAX:

POST. Apply when flax is 2 to 8 inches and weeds are in 2- to 4-leaf stage. Excellent wild buckwheat and good kochia control. Also controls several other annual broadleaves but is weak on wild mustard. Fair crop tolerance. Best crop tolerance when flax is small. Do not apply at bud stage or in humid weather when temperature is over 85° F. Minimum carrier is 10 gpa for ground and 5 gpa for air. May be underseeded to alfalfa when using bromoxynil.

Bromoxynil is available in several products: **Buctril 2L, Moxy, Broclean,** and **Brox** contain 2 lb/gal ae; **Buctril 4** contains 4 lb/gal ae. Most bromoxynil + MCPA products contain 2 lb bromoxynil + 2 lb MCPA ae/gal. Examples include **Bronate, Bison, Brox-M, Bromac, Maestro MA,** and **Vendetta. Bronate Advanced, Bison Advanced, Maestro Advanced,** and **Bromac Advanced** contains 2.5 lb ae/gal of each. Adjust rate according to the specific product label.

CURTAIL M (clopyralid + MCPA) Site of Action: 4+4 **(\$9.05-11.95)**

1.33-1.75 pt Curtail M (0.07-0.09 to 0.4-0.5 lb ai)

FLAX:

POST. Curtail M contains 0.42 lb clopyralid (Stinger) + 2.35 lb MCPA ester/gal. Apply when flax is 2 to 6 inches. Excellent Canada thistle control. Also controls wild mustard, small lambsquarters, wild buckwheat, and other susceptible annual broadleaves. Fair to good crop tolerance. May be tank-mixed with other labeled herbicides, including postemergence herbicides for grass control. Not for flax underseeded to alfalfa. Do not apply within 72 days of harvest.

BASAGRAN (bentazon) Site of Action: 6 **(\$18.75-25.00)**

1.5-2 pt Basagran 4L (0.75-1 lb ai)

FLAX:

POST. Controls annual broadleaf weeds including cocklebur, smartweed, marshelder, and wild sunflower. Useful for top growth control of Canada thistle. Contact action. Minimum carrier is 10 gpa. Add COC to improve control of larger weeds; however leaf burn may increase. Do not apply within 15 days of harvest.

CALLISTO (mesotrione) **(\$28.15)**

6 fl oz/A Callisto (0.19 lb ai)

FLAX:

Intended for foliar and residual control of several common broadleaf weed species and crabgrass suppression. If weeds are emerged at the time of application, add COC at 1% v/v (1 gallon per 100 gallons spray solution). UAN (28% N) at 2.5% v/v r AMS at 8.5 lbs/100 gallons spray solution may also be added to improve activity on emerged weeds.

PRE. Apply up to 6 fl oz/A after planting but prior to flax emergence.

HERBICIDE RESISTANT CROPS

ROUNDUP READY CANOLA

Several products are labeled for in-crop use in canola containing the Roundup Ready gene. However only certain products are labeled for use in crop. Check for label approval.

POST IN-CROP. Rates for several glyphosate product formulations for Roundup Ready in-crop application are listed below.

<i>Glyphosate Product</i>	<i>Single Application</i>	<i>Maximum In-Crop</i>
3 lb ae	16-24 oz	32 oz
3.75 lb ae	13-20 oz	26 oz
4 lb ae	12-18 oz	24 oz
4.5 lb ae	11-22 oz	22 oz
5 lb ae	10-14 oz	20 oz

Apply before the 6-leaf stage. May be followed by a sequential application at the low rate at a minimum interval of 10 days. Do not apply after 6-leaf stage. Allow 60 days between application and harvest. Adjust rate for formulation.

Make applications early when weeds are small to maximize yield potential. Repeat applications may be required for perennials. Apply with aerial or ground equipment. Avoid drift.

LIBERTY LINK CANOLA

IGNITE (glufosinate) Site of Action: 9

(\$9.15)

22 fl oz Ignite 280SL (0.4 lb ai)

Only for use in glufosinate tolerant canola designated as Liberty Link seed.

Ignite is a non-selective, non-residual, water soluble postemergence herbicide. Ignite provides rapid burndown after application. Controls many annual grasses and broadleaf weeds. Top growth on perennials will be controlled.

Applications may be made from cotyledon to early bolting stage of canola. Slight discoloration of canola may be visible after application and will not influence crop growth, maturity, or yield. Weeds that emerge after application will not be controlled. Sequential postemergence applications can be made 10 to 14 days apart. Rainfast in 4 hours after application. Minimum carrier is 15 gpa water for ground application or 10 gpa for aerial application. Must be applied with AMS at 1.5-3 lb/A. Do not add surfactants or crop oil. Anti-foam or drift agents may be added if needed.

Do not apply when wind causes drift to desirable or off-target vegetation. Do not cultivate 5 days before or 5 days after application. Do not apply within 65 days of harvest or graze treated crop or cut for hay. Do not make more than 2 applications of Ignite per growing season. If Ignite was applied as a burndown, do not apply Ignite postemergence. To improve grass control, may tank-mix with Assure II (4-5 fl oz/A), Poast (6-8 fl oz/A), Select 2EC (2-3 fl oz/A), or Select Max (4-6 fl oz/A). Crops with the Liberty Link designation may be planted at any time.

CLEARFIELD CANOLA

BEYOND (imazamox) Site of Action: 2

(\$17.15)

4 oz Beyond 1L (0.031 lb ae)

For postemergence application in Clearfield (imidazolinone tolerant) varieties. Controls several annual weeds including cocklebur, sunflower, black nightshade, mustard, pigweed, foxtail, wild oat, "cheatgrass", and volunteer cereals (non Clearfield). Does not control ALS resistant weed biotypes. Weeds should be less than 3 inches for best results. Weed control and crop tolerance have been very good in SDSU tests. Minimum carrier is 10 gpa for ground and 5 gpa for air. Add NIS at 1 qt plus AMS at 12 to 15 lb or 28% N at 2.5 gal/100 gal solution.

POST. Apply early postemergence and before bloom stage.

Does not control ALS resistant weed biotypes.

CLEARFIELD SUNFLOWER

BEYOND (imazamox) Site of Action: 2

(\$17.15)

4 oz Beyond 1L (0.031 lb ae)

Provides a new postemergence weed control program for use on Clearfield (imidazolinone tolerant) varieties only. The tolerance trait was isolated from wild sunflower and incorporated into commercial seed by conventional breeding techniques. Gives very good to excellent control of several annual broadleaf weeds, including special problem weeds such as cocklebur, mustard, marshelder, black nightshade, pigweed, purslane, and wild sunflower. Labeling include green and yellow foxtail, "cheatgrass", wild oat, and volunteer cereals. Most broadleaves should be less than 3 inches and grasses 1 to 5 inches. Beyond fits well following soil applied Prowl or other herbicide. Crop tolerance and weed control has been satisfactory in SDSU tests. Control is most consistent if weeds are small and grasses have not developed expanded tillers. No carryover restrictions for most following year crops. Minimum carrier is 10 gpa for ground or 5 gpa for air. Add NIS at 1 qt/100 gallons spray solution and either 285 N at 2.5 gallons/100 gallons or AMS at 12-15 lbs/100 gallons spray solution.

The technology should be managed to reduce risk of developing resistance in wild sunflower. Use crop and herbicide rotations. Avoid fields with heavy sunflower history. Burndown emerged wild sunflower with non-ALS chemistry before planting. Limit ALS herbicide to no more than 2 years out of 4 in a field.

POST. Apply at the 2 to 8 leaf crop stage.

EXPRESS SUNFLOWER

EXPRESS (tribenuron) *Site of Action: 2*

(\$4.35-8.70)

0.25-0.5 oz Express 50SG (0.008-0.02 lb ai)

For Express tolerant (ExpressSun) varieties only. Relative to Beyond in Clearfield sunflowers, Express may be slightly more active on some broadleaf weeds but less active on grass weeds. May be tank mixed with Assure (quizalofop) for grass control. Provides control or suppression of difficult broadleaf weed species, such as cocklebur, Canada thistle, puncturevine, pigweed (redroot and tumble), lambsquarters, marshelder, and others. No significant rotation restrictions as most crops can be planted 45-60 days after applications.

Add MSO at 1% v/v (1 gallon per 100 gallons spray solution). Minimum carrier volume is 5-10 gpa (depending on nozzles) for ground application or 2 gpa for aerial applications.

POST. Apply to weeds 2-4 inches tall.

Group Numbers Associated with Herbicide Sites or Modes of Action

WSSA Group Number	Site of Mode of Action	Examples
1	ACCase inhibitor	clethodim, sethoxydim
2	ALS inhibitor	imazamethabenz, imazamox
3	Microtubule inhibitor	pendimethalin, trifluralin
4	Growth regulator	clopyralid, MCPA
6	Photosynthesis inhibitor (contact)	bentazon, bromoxynil
8	Lipid synthesis inhibitor (thiocarbamates)	EPTC, butylate
9	EPSP inhibitor	glyphosate
14	Cell membrane disrupter (PPO inhibitor)	sulfentrazone
15	Seedling shoot inhibitor	metolachlor
22	Cell membrane disrupter (PSI inhibitor)	paraquat
27	Bleacher (HPPD)	mesotrione

Table 1. Crop Rotation Intervals for Oilseed Crops.

Planting intervals are listed in the table below for several herbicides and the oilseed crops in this guide. Herbicides included have restrictions affecting crops to be planted the following season. Restrictions are based on normal use and timing for the product used alone. Refer to product label restrictions.

**MINIMUM APPLICATION to PLANTING INTERVAL in MONTHS
(Rotational Crops for the Following Season)**

Herbicide	Sunflower		Safflower		Canola		Flax	
Accent/Steadfast	11	18	10	18	10	18	10	18
	<7.5 pH+14 in/>7.5 pH		<6.5 pH/>6.5 pH		<6.5 pH/>6.5 pH		<6.5 pH/>6.5 pH	
Accent Gold	18		26+Bio		26+Bio		26+Bio	
Aim EW	12		12		12		12	
Ally/Ally Extra	22		22		34+Bio&28 in.		22	
Amber	24+Bio		Bio		Bio		Bio	
Assert	NS		NS		15		15	
Atrazine	24		24		24		2 nd Yr	
Authority	30		30		30		18	
Axiom	NS		NS		NS		NS	
Axiom AT	2 yr		2 yr		2 yr		2 yr	
Balance	12		12		12		12	
Basis/Basis Gold	10		18		18		18	
Beacon	8		18		18		18	
Beyond	9 ^B		18		18 ^A		18	
Callisto	NS		18		NS		18	
Celebrity/Celebrity Plus	11	18	10	18	10	18	10	18
	<7.5 pH+14 in/>7.5 pH		<6.5 pH/>6.5 pH		<6.5 pH/>6.5 pH		<6.5 pH/>6.5 pH	
Classic	9		30		18		18	
Command	12		12		12		12	
Command Extra	18		18		24		18	
Curtail, Curtail M	10.5		10.5		5		5	
	18<15 in<2% OM		18<15 in<2% OM					
Epic	2 nd Yr		2 nd Yr		2 nd Yr		2 nd Yr	
Exceed	18		18		18		18	
Finesse	Bio		Bio		Bio		Bio	
FirstRate	30+Bio		30+Bio		30+Bio		30+Bio	
Flexstar	18		18		18		18	
Harness/Surpass	2 nd Yr		2 nd Yr		2 nd Yr		2 nd Yr	
Hornet	18		26+Bio		26+Bio		26+Bio	
Lightning	18		18		40+Bio		40+Bio	
Lumax	2 Yr		2 Yr		2 Yr		2 Yr	
Maverick	2 Yr+Bio		2 Yr+Bio		2 Yr+Bio		2 Yr+Bio	
NorthStar	8		18		18		18	
Olympus	Bio		Bio		Bio		Bio	
Osprey/Silverado	1		10		10		10	
Outlook	NS		NS		NS		NS	
Paramount	10		10		10		24+Bio	
Peak	22		22		22		22	
Pursuit	18		18		40+Bio		40+Bio	
Python	18		26+Bio		26+Bio		26+Bio	
Raptor	9 ^B		18		18 ^A		18	
Synchrony	9		30		18		18	
Scepter	18		18		26		18	
Spartan	0		12+Bio		24		12+Bio	
Stinger	10.5/18<15 in<2% OM		10.5		0		0	
Tordon	36+Bio		36+Bio		36+Bio		36+Bio	
Valor	1<2 oz		12+Bio		12+Bio		12+Bio	
WideMatch	10.5/18<15 in<2% OM		10.5		4		4	

Bio = Field bioassay required

IN=Inches of rainfall required after application and before planting of rotational crop.

NS=Next season

A = 0 months if Clearfield canola is planted.

B = 0 months if Clearfield sunflowers are planted.

WEED RESPONSE to HERBICIDES

WEED RESPONSE. Weed control percentages are intended as a guide for comparing alternatives. Percentages are estimated based on favorable conditions.

E = Excellent	90-95%	Usually over 90%. Seldom 100%.	Best choice for weed.
G = Good	80-90%	Sometimes under 80%. Seldom over 90%.	Usually satisfactory.
F = Fair	65-80%	Sometimes under 65%. Seldom over 80%.	Sometimes unsatisfactory. Moderate infestation.
M = Marginal	40-65%	Seldom over 65%. Erratic.	Seldom satisfactory. Light infestations only.
P = Poor		Usually under 40% or no control.	Not recommended.

CROP RESPONSE. Crop response is based on visual symptoms. Early-season symptoms do not necessarily cause yield losses.

N = None; VS = very slight; S = slight; M = moderate; H = high
+ = usually high part of range

HERBICIDE	WEED RESPONSE														CROP RESPONSE				
	Green foxtail	Yellow foxtail	Wild oat	Gen. Broadleaf	Redroot pigweed	Smartweed	Lambsquarters	Mustard	Wild buckwheat	Common ragweed	Kochia (ALS)	Cocklebur	Sunflower	Broadleaf Perennials	Quackgrass	Sunflower	Safflower	Canola	Flax
Trifluralin	E	G+	F+	F	G+	P	G	P	P	P	M+	P	P	P	N	N	N	M	
Pendimethalin	E	G+	F+	F	G+	P	G	P	P	P	M+	P	P	P	N	--	--	--	
Eptam	E	F	G+	M	G	P	F	P	P	P	P	P	P	P	S	--	--	--	
Sonalan	E	G+	G	F	E	P	G+	P	F	P	M+	P	P	P	N	N	N	--	
Poast	E	F	G+	P	P	P	P	P	P	P	P	P	P	F	N	--	N	N	
Assert	P	P	G+	P	P	P	P	G+	F+	P	M	P	P	P	VS	--	--	--	
Assure II	E	F	G+	P	P	P	P	P	P	P	P	P	P	F	M	--	N	N	
Select	E	F	G+	P	P	P	P	P	P	P	P	P	P	F	N	N	VS	N	
Dual II Magnum	G	F+	P	M	G	P	M	P	P	P	M	P	P	P	VS	N	--	--	
Micro-Tech	G	F+	P	M	G	P	M	P	P	P	M	P	P	P	S	--	--	--	
Spartan	M	P	P	G	G	F	G	P	F	P	E	P	P	P	S	--	--	--	
Ignite*	E	G	G+	G+	G	E	G	E	F	G	G	E	E	F	G	--	--	VS	--
MCPA	P	P	P	F+	F	G	E	E	M	M	P	F	F+	F+	P	--	--	--	S
Curtail M	P	P	P	G+	F	G	G	G+	G	G	F	F	E	P	P	--	--	--	S
Bromoxynil	P	P	P	F+	G	G+	G	F	E	G	G	E	E	P	P	--	--	--	M
Glyphosate*	E	F	F	E	E	G+	E	E	F	E	E	E	E	G	E	--	--	VS	--
Gramoxone	G	G	F	G	G+	F	E	E	F	G	G	G	E	F	F	--	--	--	--
Stinger	P	P	P	M	M	M	M	P	F	G	P	G	G	E	P	--	--	S	--
Beyond*	G	F	F	G+	E	E	M	E	F	G	P	E	E	M	P	VS	--	VS	--
Express*	P	P	P	G+	E	M	E	E	F	G	P	G	M	M	P	VS	--	--	--

*Herbicide Resistant Crop Only