

# WEED CONTROL

## in Oilseed Crops: 2009

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; incorporate 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

*Tradenames 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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## 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 before using.

**Applicator Safety.** It is a violation of federal pesticide laws to use an herbicide inconsistent with its labeling. Read the entire label before using. The most serious risk of exposure from chemicals is during handling and mixing operations with 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.

**Poison Control Center - 1-800-222-1222**

**Water Protection.** Preventing spills and accidents during handling and mixing reduces risk of groundwater and surface water contamination. Mix herbicides away from wells and water sources. Prevent back-siphoning into wells. 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.

## SUNFLOWER WEED CONTROL

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 no-till 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.

Be sure to burn down emerged weeds at planting. Use row cultivation if required.

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 postemerge 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 seasons when rainfall provides early herbicide activation. Labeling is not anticipated.

Granular applications in the fall followed by a shallow tillage at planting provide an excellent option in reduced-till systems. This maintains a high percentage of crop residue during the critical period in fall and early spring.

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**TREFLAN or TRIFLURALIN (trifluralin) Site of Action: 3****(\$3.40-9.10)****1-2 pt trifluralin 4L or 5-10 lb Treflan 10G (.5-1 lb ai)**

Excellent control of most annual grasses and fair control of small-seeded annual broadleaves such as pigweed and lambsquarters. Consistent performance. 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. Minimum carrier is 5 gpa for ground or air.

**PPI SPRING or FALL:** Granules or spray may be applied in the fall after October 15 or in the spring before planting. Crop residue interferes less with granules than with spray. Fall application makes it possible to limit spring tillage to a single pass which serves as the second incorporation.

**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 reduced tillage systems designed to maintain residue in the fall and early spring.

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**PROWL (pendimethalin) Site of Action: 3****(\$3.95-14.90)****1.2-3.6 pt Prowl or Pendimax 3.3L (.5-1.5 lb ai)****2-3 pt Prowl H<sub>2</sub>O 3.8L (.9-1.5 lb ai)**

Additional 3.3L products include 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 H<sub>2</sub>O is a new water-based formulation that has performed well in higher residue and causes less staining.

**EPSS:** 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 before planting. Rates are 1.2 to 3.6 pt of 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.

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**SONALAN (ethalfluralin) Site of Action: 3****(\$6.55-13.65)****1.5-3 pt Sonalan HFP 3L or 5.5-11.5 lb Sonalan 10G (.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. Rate of 3 pt of 3L or 11.5 lb of 10G per acre has been satisfactory in most SDSU tests. 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.

**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.

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**EPTAM (EPTC) Site of Action: 8****(\$12.75-17.85)****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.

**PPI.** 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.

**TANK-MIXES****2.25 pt Eptam 7L + 1-2 pt trifluralin 4L (2+5-1 lb ai) (\$14.85-18.30)****2.5-3.5 pt Eptam 7L + 1.25-3 pt Sonalan 3L (2.2-3 + .66-1.1 lb ai) (\$18.20-32.95)**

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. Somewhat improved control of Russian thistle and kochia than for Eptam alone and slightly better 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.

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**SPARTAN (sulfentrazone) Site of Action: 14****(\$11.65-31.05)****3-8 oz Spartan 4F (.09-.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.

Rate varies with soil texture. Use 3.75-6.0 oz/A for most soils (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% OM. 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% OM. 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.

**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 perennial weeds.

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

**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.

**PREMIX****SPARTAN ADVANCE (sulfentrazone + glyphosate) Site of Action: 14+9****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.

## SPARTAN (Continued . . . )

**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.

**EPDS 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**

#### **3.75-10.2 fl oz Spartan Advance (0.09-0.25 + 0.01-0.03 lbs ai)**

Rates vary by soil texture, organic matter (O.M.), and soil pH. Spartan Charge at 5.5 fl oz/A contains the equivalent active ingredients as Sparatan 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.

**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.

**EPDS 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.

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

**(\$13.50-27.05)**

### **1-2 pt Dual Magnum 7.62L (.95-1.9 lb act)**

Additional 7.62L products include Brawl and Charger Basic. Dual is used primarily for annual grass control. Foxtail control is dependent upon adequate precipitation prior to weed emergence. It has limited activity on broadleaves such as pigweed. Crop tolerance in SDSU tests has been very good.

Rates of 1.5 to 2 pt per acre have been used in most 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.

**PPI.** Incorporated shallowly into the top 2 inches. Early application followed by a burndown at planting gives more consistent results in no-till.

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

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## **POAST (sethoxydim) Site of Action: 1**

**(\$4.90-14.65)**

### **.5-1.5 pt Poast 1.5L (.1-.3 lb ai)**

Very good control of annual grass and suppression of quackgrass. 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. AMS (2.5 lb) or 28% N (1 gal/A) may be added to improve control of volunteer cereal, wild oat, and quackgrass.

**POST.** Use .5 pt for wild proso millet (10 in); .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.

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**SELECT or SELECT MAX (clethodim) Site of Action: 1 (\$12.85-34.25)**

**6-16 oz Select 2L or 12-32 oz Select Max (.09-.25 lb ai)**

Additional 2L products include Volunteer, Intensity, Shadow, Section 2EC, and Arrow; Intensity One is a 0.97L product. Very good to excellent control of annual grasses. Provides quackgrass suppression. Grasses should be actively growing. Do not cultivate one week before or after application. Minimum carrier is 10 gpa for ground or 3 gpa for air. Good coverage improves results. Do not apply within 70 days of harvest. Always add COC at 1 qt per acre for ground or 1 gal/100 gal (but not less than 1 pt/A) for air. AMS at 2 to 4 lb or 28% N at 1 to 2 qt per acre should be added for most applications.

**POST:** 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 control of perennial grasses.

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**ASSURE II (quizalofop) Site of Action: 1 (\$5.75-13.75)**

**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. Do not cultivate one week before or after application. Maximum use rate is 18 oz/A per year. For repeated applications, allow at least 7 days between applications. Avoid application if sunflowers are stressed.

Add NIS at 0.25% v/v (1 qt/100 gal). 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.

**POST:** Apply when annual grass weeds are 2-6 inches tall for most species. Check the label for rates based on the weed species present. Do not apply within 60 days of harvest.

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**ASSERT (imazamethabenz) Site of Action: 2 (\$7.50-14.95)**

**.6-1.2 pt Assert 2.5L (.2-.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 .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 .6 to .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.

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**GRAMOXONE (paraquat) Site of Action: 22**

Additional paraquat products include Firestorm 3L and Parazon 3L.

**2.5-4 pt Gramoxone Inteon 2L (.5-1.0 lb ai) (\$10.50-16.85)**

**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.

**1.2-2.0 pt Gramoxone Inteon 2L (.3-.5 lb ai) (\$5.05-8.40)**

**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.**

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**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 sunflower.** Examples of concentrations in products that are labeled: 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.

|  |                       |
|--|-----------------------|
| <b><u>16-32 oz glyphosate 3 lb ae (.38-.75 lb ae)</u></b>    | <b>(\$4.15-9.20)</b>  |
| <b><u>13-26 oz glyphosate 3.75 lb ae (.38-.75 lb ae)</u></b> | <b>(\$4.85-9.60)</b>  |
| <b><u>12-24 oz glyphosate 4 lb ae (.38-.75 lb ae)</u></b>    | <b>(\$4.90-13.50)</b> |
| <b><u>12-23 oz glyphosate 4.17 lb ae (.38-.75 lb ae)</u></b> | <b>(\$5.50-12.90)</b> |
| <b><u>11-21 oz glyphosate 4.5 lb ae (.38-.75 lb ae)</u></b>  | <b>(\$6.10-13.35)</b> |
| <b><u>10-19 oz glyphosate 5 lb ae (.38-.75 lb ae)</u></b>    | <b>(\$5.50-10.45)</b> |

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. High rate listed is the maximum allowed for sunflower burndown. 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.

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

**PRE-HARVEST:** Roundup WeatherMax, Roundup Original Max, and Roundup PowerMax are registered for pre-harvest applications. Apply no more than 22 oz/A after sunflower plants are mature (seed less than 35% moisture and back of heads are turning yellow and the bracts are turning brown).

**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.

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**AIM (carfentrazone) (\$3.15-13.45)**

**0.5-2 fl oz Aim 2EC or Aim 1.9EW (0.008-0.031 lb ai)**

**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.

**HOODED SPRAYER APPLICATION:** Apply 0.5 to 2.0 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).

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**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. Minimum carrier is 5 to 10 gpa for air or 20 to 30 gpa for ground.

**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.

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## CLEARFIELD SUNFLOWER

**BEYOND** (*imazamox*) *Site of Action: 2*

(\$18.30)

### 4 oz Beyond 1L (.031 lb ae)

Provides a new postemergence weed control program for use on Clearfield (imadazolinone 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 includes 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 28% 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.

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## 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.

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**TREFLAN or TRIFLURALIN** (trifluralin) *Site of Action: 3*

(\$3.40-11.35)

### 1-2.5 pt trifluralin 4L or 5-12.5 lb Treflan 10G (.5-1.25 lb ai)

Trifluralin gives excellent control of foxtail and fair control of pigweed and lambsquarters. High rates provide some kochia control. Wild buckwheat is not controlled adequately; it does not control mustard and sunflower. Crop tolerance in SDSU tests has been excellent. Maximum rate for fall application is higher than for spring. Carryover may damage oats or sorghum planted the following year. Minimum carrier is 5 gpa for ground or air.

Performance, especially with heavy weed pressure, is dependent on thorough incorporation. Weed control with surface application has been less consistent and unsatisfactory in some tests. However fall or early spring surface treatments may be adequate if grass pressure is light and if moisture conditions are adequate soon after application.

**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.

**Granules:** Incorporate within 24 hours. May be applied in standing stubble. A chisel with sweeps may be used for the first incorporation. Incorporate a second time, anytime before planting. Fall-applied granules are especially useful in reduced tillage systems designed to maintain residue in the fall and early spring and to reduce spring tillage.

**PPI SPRING:** Rates are .5 to 1 lb ai per acre (1-2 pt 4L). Allow 2 to 3 days between incorporation passes if using granules in the spring.

**PPI FALL:** Rates are .75 to 1.25 lb ai per acre (1.5-2.5 pt 4L or 7.5-12.5 lb 10G). Granules preferred. Apply after September 1. Fall application makes it possible to limit spring tillage to a single pass.

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**SONALAN (ethalfluralin) Site of Action: 3 (\$6.55-13.65)**

**1.5-2.5 pt Sonalan 3L or 5.5-11.5 lb Sonalan 10G (.55-1 lb ai)**

Excellent control of most annual grasses and fair to good control of small-seeded broadleaves such as pigweed and lambsquarters. Does not control sunflower, cocklebur, or wild mustard. Usually gives fair wild oat control. Excellent crop tolerance. Rate of 2.5 pt of 3L or 9.5 lb of 10G per acre is suggested for most situations. Minimum carrier is 5 gpa. Less soil residual than Treflan; no label limitations for common crops for the following year. Do not graze or feed forage on treated fields.

**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 48 hours. With granules, delay second incorporation 3 to 5 days. Second pass may improve uniformity.

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**DUAL II MAGNUM or DUAL MAGNUM or CINCH (s-metolachlor) Site of Action: 15 (\$6.85-29.20)  
STALWART or PARALLEL (metolachlor)**

**1-2 pt Dual II Magnum or Dual Magnum 7.6L or Cinch (.95-1.9 lb ai)**

**1-2 pt Stalwart 8L or Parallel 7.8L or Parallel PCS 8L (.98-2 lb ae)**

Additional 7.62L s-metolachlor products include Brawl, Charger Basic, Dual Magnum, and Medal; 7.64L products include Brawl II and Medal II. Metolachlor is 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 1.3 to 1.7 pt per acre have been satisfactory in SDSU tests. Products designated Magnum contain a more active isomer (s-metolachlor) and product rates were reduced relative to metolachlor (e.g. Stalwart 8L). Minimum carrier is 5 to 10 gpa for ground or 2 gpa for air. Dual granules are not labeled for safflower.

**PPI:** Incorporate shallowly into the top 2 inches within 14 days of planting. Avoid deep or uneven incorporation. Weed control is more consistent than for preemergence application when rainfall is limited.

**PRE:** Apply after planting but before weed emergence. Rainfall required.

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**EPTAM (EPTC) Site of Action: 8 (\$17.85)**

**3.5 pt/A Eptam 7E (3 lb ai)**

**15 lb/A Eptam 20G (3 lb ai)**

Controls several annual grass weed species and suppresses some small-seeded broadleaf weed species. Incorporate into the top 2-3 inches of soil immediately after application to prevent herbicide loss due to volatilization. Minimum carrier is 10 gpa for broadcast ground applications.

**PPI:** Apply and incorporate just before planting.

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**SELECT MAX (clethodim) Site of Action: 1 (\$9.65-17.15)**

**9-16 fl oz/A Select Max 0.97L (0.07-0.12 lb ai)**

Arrow and Shadow are additional 2L products; Intensity One is a 0.97L product. Controls several annual grass weed species and suppresses quackgrass. Grasses should be actively growing.

Add NIS at 0.25% v/v (1 qt/100 gallons). For repeated applications, allow at least 14 days between applications. Do not apply more than 64 fl oz/A (0.5 lb ai/A) per season. Minimum carrier volume is 5 gpa for ground applications or 3 gpa for aerial applications. Good coverage improves weed control.

**POST:** Apply when annual grass weeds are approximately 2-6 inches tall, but check label for specific grass species. For Select Max apply 9-16 fl oz/A for annual grass weed species or 12-16 fl oz/A for perennial grass species. Do not apply less than 70 days prior to harvest.

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**POAST (sethoxydim) Site of Action: 1** **(\$9.75-24.40)**

**1-2.5 pt/A Poast (0.19-0.47 lb ai)**

Provides good to excellent control of several annual grass weed species and suppression of quackgrass. Grasses should be actively growing at the time of application.

Add COC at 1 qt/A or MSO at 1.5 pt/A. Add AMS (2.5 lb/A) or 28% N (0.5-1 gal/A) to improve control of volunteer cereal, wild oat, or quackgrass. Minimum carrier is 10 gpa for ground applications or 5 gpa for aerial applications.

**POST:** Apply when annual grass weeds are less than 4-8 inches tall, but check label for specific grass species. Do not apply less than 30 days prior to harvesting.

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**GRAMOXONE (paraquat) Site of Action: 22** **(\$10.50-16.85)**

**2.5-4 pt Gramoxone Inteon 2L (0.6-1 lb ai)**

Additional paraquat products include Firestorm 3L and Parazone 3L. 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 toxic if ingested. **Restricted Use Pesticide.**

**PRE:** Apply anytime prior to planting or after planting, but before crop emergence.

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

Glyphosate is available in several products; **however only certain products are labeled for burndown in safflower.** Examples of concentrations in products that are labeled: 3 lb ae (4 lb ai) and 4.5 lb ae (5.5 lb ai). Check specific product label.

**16-32 oz glyphosate 3 lb ae (.38-.75 lb ae)** **(\$4.05-9.20)**

**12-23 oz glyphosate 4.1 lb ae (.38-.75 lb ae)** **(\$5.50-12.90)**

**11-21 oz 4.5 lb ae (.38-.75 lb ae)** **(\$6.10-13.35)**

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 of most annual weeds. Use the low rate for small, susceptible annuals; the high rate for larger, mixed populations. Higher rates may be used as required for more tolerant annuals or improved control 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.

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

**PRE-HARVEST:** Roundup WeatherMax, Roundup Original Max, and Roundup PowerMax are registered for pre-harvest applications. Apply no more than 22 oz/A after safflower seeds have lost their opaque color, which is approximately 20 to 30 days after the end of flowering on the secondary branches.

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

**3.2 qt Defol 7.5L (6 lb ai)**

Useful to facilitate harvest and reduce moisture in crops. Contact action. Apply when crop is fully mature. Rate is 3.2 qt per acre. Minimum carrier is 5 to 10 gpa for air or 20 to 30 gpa for ground.

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

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## CLEARFIELD CANOLA

**BEYOND (imazamox) Site of Action: 2**

**(\$18.30)**

**4 oz Beyond 1L (.031 lb ae)**

For postemergence application in Clearfield (imadazolinone 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.

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## LIBERTY LINK CANOLA

**IGNITE (glufosinate) Site of Action: 9**

**(\$11.00)**

**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. Topgrowth 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 postemerge 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 post-emergence. 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.

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## Flax Herbicides

**MCPA AMINE or MCPA ESTER Site of Action: 4**

**(\$1.25-1.35)**

**.25 lb ae MCPA amine or MCPA ester (.25 lb ae)**

**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.

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| <b>BROMOXYNIL PRODUCTS (bromoxynil) Site of Action: 6</b> | <b>(\$8.40-9.05)</b> |
| <b>BROMOXYNIL + MCPA PRODUCTS (bromoxynil + MCPA)</b>     | <b>(\$5.05-6.85)</b> |

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**1 pt bromoxynil 2L or .5 pt bromoxynil 4L (.25 lb ae)**  
**.9 pt bromoxynil/MCPA 4L or .72 pt Bronate Advanced 5L (.2 + .2 lb ae)**

**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 **Bromox MCPA and Wild Card Xtra. Bronate Advanced, Bison Advanced, and Bromac Advanced** contains 2.5 lb ae/gal of each. Adjust rate according to the specific product label.

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| <b>CURTAIL M (clopyralid + MCPA) Site of Action: 4+4</b> | <b>(\$8.25-10.85)</b> |
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**1.33-1.75 pt Curtail M (.07-.09 to .4-.5 lb ai)**

**POST:** Curtail M contains .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.

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| <b>BASAGRAN (bentazon) Site of Action: 6</b> | <b>(\$18.70-24.95)</b> |
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**1.5-2 pt Basagran 4L (.75-1 lb ai)**

**POST:** Controls annual broadleaf weeds including cocklebur, smartweed, marshelder, and wild sunflower. Useful for topgrowth 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.

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| <b>TREFLAN (trifluralin) Site of Action: 3</b> | <b>(\$3.40-9.10)</b> |
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**1-2 pt Treflan 4L or 5-10 lb Treflan 10G (.5-1 lb ai)**

**PREPLANT:** Apply in the fall, after September 1, and incorporate. Not approved for spring application. Granules preferred, especially with heavy residue. Work crop residue to a manageable level before application; however, granules may be applied into standing stubble. Incorporate one time within 24 hours. Use a disk or field cultivator for the second pass. Make second pass at a right angle. Use low rates for light, sandy soil. Rate of 1.5 pt or 7.5 lb granules per acre suggested for most soils. Consistent weed control. Crop tolerance is fair; some thinning may occur under poor emergence conditions. Slight reductions seldom affect yield. Seedbed should be firm. Delay seeding until seedbed warms. Plant less than 1.5 inches deep with a press or hoe drill. Minimum carrier is 5 gpa. Consult labeling on other trifluralin products.

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| <b>POAST (sethoxydim) Site of Action: 1</b> | <b>(\$4.90-14.65)</b> |
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**.5-1.5 pt Poast 1.5L (.1-.3 lb ai)**

**POST:** For postemergence grass control. Treat annual grasses before they reach 4 inches to minimize competition. Consistent control. Drought stress reduces effectiveness. Use .5 pt for wild proso (10 in); 1 pt for barnyardgrass, wild oat, and foxtail (4 in) and volunteer corn (8 in); and 1.5 pt per acre for volunteer cereals (6 in). Always add 1 qt per acre COC. AMS (2.5 lb) or 28% N (1 gal) may be used when not tank-mixed with other herbicides for flax. AMS improves control of volunteer corn, cereals, and wild oat. Minimum carrier is 5 gpa.

**.5-1.5 pt Poast 1.5L + 1 pt bromoxynil 2L or .5 pt 4L (.1-.3 + .25 lb ae)**

**.5-1.5 pt Poast 1.5L + .9 pt bromoxynil/MCPA 4L or .72 pt 5L (.1-.3 + .2 + .2 lb ae)**

**.5-1.5 pt Poast 1.5L + .25 lb ae MCPA (.1-.3 + .25 lb ae)**

Tank-mixes. Poast controls annual grasses; bromoxynil or MCPA controls broadleaves. Results in SDSU tests have been very good. Some leaf burn may be noted. Use crop oil as for Poast alone. Refer to section for bromoxynil or Poast alone.

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**SELECT or SELECT MAX (clethodim) Site of Action: 1****(\$12.85-17.15)****4-5 oz Select 2L (.06-.08 lb ai) or 12-16 oz Select Max 0.97L (0.09-0.12 lb ai)**

Additional 2L products include Arrow, Intensity, Clethodim 2E, Shadow, and Volunteer; Intensity One is a 0.97L formulation. Very good to excellent control of annual grasses. Minimum carrier is 10 gpa for ground or 3 gpa for air. Do not apply Select within 75 days of harvest or Select Max within 60 days of harvest. . Add COC at 1 gal/100 gal. Addition of 28% N is not recommended. Apply prior to bloom. Crop injury may occur if applied during bloom. Do not exceed 5 oz/A Select or 32 oz/A Select Max in a season.

**POST:** Use 4 oz/A of Select or 8 oz/A of Select Max for control of volunteer corn (4-12 in), wild proso millet (1-6 in), shattercane (4-10 in), and barnyardgrass (1-4 in) or 5 oz/A of Select or 10 oz/A of Select Max per acre for green and yellow foxtail, volunteer barley, oats, wheat, and wild oat (1-4 in).

Tank-mixes. Select provides good to excellent control of annual grasses. Bromoxynil and MCPA control broadleaf weeds. Some leaf burn may occur. For Select, use COC at 1 gal/100 gal. For Select Max, use NIS (0.125% v/v) and AMS (2.4-4 lb/A) for ground application or just AMS (2.5-4 lb/A) for aerial application.

**4-5 oz Select or 8-10 oz Select Max+1 pt bromoxynil 2L (.06-.08+.25 lb ae)****4-5 oz Select or 8-10 oz Select Max+0.25-0.5 pt MCPA****8-10 oz Select Max + 11.4 fl oz Bronate Advanced**

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**ASSURE II (quizalofop) Site of Action: 1****(\$5.75-13.75)****5-12 fl oz/A Assure II (0.03-0.08 lb ai)**

Controls several annual grass weed species and suppresses quackgrass. Apply to young, actively growing grass weeds. Do not cultivate one week before or after application. Maximum use rate is 24 oz/A per year. For repeated applications, allow at least 7 days between applications.

Add either a COC or NIS. Add COC at 1% v/v (2% v/v in arid conditions) or 0.5% v/v (2 qt/100 gal) for aerial applications. Add NIS at 0.25% v/v (1 qt/100 gal). UAN (28 or 32% N) at 2 qt/A or AMS at 2 lb/A may be added in addition to either COC or NIS. Use UAN at 4 qt/A or AMS at 4 lb/A in arid conditions. Minimum carrier is 10 gpa for ground applications or 3 gpa for aerial applications.

**POST:** Apply when annual grass weeds are 2-6 inches tall for most species. Check the label for rates based on the weed species present. Do not apply within 70 days of harvest.

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**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 use in flax.** Products designated as 3 lb ae (4 lb ai); 3.75 lb ae (5 lb ai); 4 lb ae (5.4 lb ai); and 4.5 lb ae (5.5 lb ai).

**16-32 oz glyphosate 3 lb ae (.38-.75 lb ae) (\$4.05-9.20)****13-26 oz glyphosate 3.75 lb ae (.38-.75 lb ae) (\$4.85-9.60)****12-24 oz glyphosate 4 lb ae (.38-.75 lb ae) (\$4.90-13.50)****11-21 oz glyphosate 4.5 lb ae (.38-.75 lb ae) (\$6.10-13.35)**

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. Use the low rate for small annuals, mid rate for variable annual weeds, and the high rate for 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.

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

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**CALLISTO (mesotrione)**

**6 fl oz/A Callisto (0.19 lb ai)**

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 or 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.

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**AIM (carfentrazone)**

**(\$3.05-12.20)**

**0.5-2 fl oz Aim EC or Aim EW (0.008-0.031 lb ai)**

**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.

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**DEFOL (sodium chlorate)**

**(\$6.50)**

**3.2 qt Defol 7.5L (6 lb ai)**

Useful to desiccate weeds and reduce moisture in crop. Also reduces risk of crop loss associated with swathed crop. Contact action. Apply when crop is fully mature. Rate is 3.2 qt per acre. May add NIS at 0.25% v/v (1 qt/100 gallons). Minimum carrier is 5 gpa for air or 10 gpa for ground.

**HARVEST AID:** Apply 7 to 10 days before harvest. Do not graze treated fields or use for forage for 14 days after application.

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### Group Numbers Associated with Herbicide Sites or Modes of Action

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| <b>WSSA<br/>Group<br/>Number</b> | <b>Site of Mode of Action</b>              | <b>Examples</b>            |
|----------------------------------|--|----------------------------|
| 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                 |

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**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 |
|                          | <7.5pH+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 <sup>nd</sup> 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 <sup>B</sup>        |    | 18                   |    | 18 <sup>A</sup>      |    | 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 <sup>nd</sup> year  |    | 2 <sup>nd</sup> year |    | 2 <sup>nd</sup> year |    | 2 <sup>nd</sup> year |    |
| 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 <sup>nd</sup> Yr    |    | 2 <sup>nd</sup> Yr   |    | 2 <sup>nd</sup> Yr   |    | 2 <sup>nd</sup> 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 <sup>B</sup>        |    | 18                   |    | 18 <sup>A</sup>      |    | 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%.<br>Seldom 100%.        | Best choice for weed.                              |
| G = Good      | 80-90% | Sometimes under 80%.<br>Seldom over 90%. | Usually satisfactory.                              |
| F = Fair      | 65-80% | Sometimes under 65%.<br>Seldom over 80%. | Sometimes unsatisfactory.<br>Moderate infestation. |
| M = Marginal  | 40-65% | Seldom over 65%.<br>Erratic.             | Seldom satisfactory.<br>Light infestations only.   |
| P = Poor      |        | Usually under 40%<br>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 | Lambsquarter | Mustard | Wild Buckwheat | Kochia | Kochia (ALS) | Cocklebur | Sunflower | Broadleaf Perennials | Quackgrass | Sunflower | Safflower | Canola | Flax |
| Trifluralin    | E             | G+             | F+       | F              | G+              | P         | G            | P       | P              | M+     | M+           | P         | P         | P                    | P          | N         | N         | N      | M    |
| Pendimethalin  | E             | G+             | F+       | F              | G+              | P         | G            | P       | P              | M+     | M+           | P         | P         | P                    | P          | N         | -         | -      | -    |
| Eptam          | E             | E              | G+       | M              | G               | P         | F            | P       | P              | P      | P            | P         | P         | P                    | S          | -         | -         | -      | -    |
| Sonalan        | E             | G+             | G        | F              | E               | P         | G+           | P       | F              | M+     | M+           | P         | P         | P                    | P          | N         | N         | N      | -    |
| Poast          | E             | E              | G+       | P              | P               | P         | P            | P       | P              | P      | P            | P         | P         | P                    | F          | N         | -         | N      | N    |
| Assert         | P             | P              | G+       | P              | P               | P         | P            | G+      | F+             | M      | M            | P         | P         | P                    | P          | VS        | -         | -      | -    |
| Assure II      | E             | E              | G+       | P              | P               | P         | P            | P       | P              | P      | P            | P         | P         | P                    | F          | N         | -         | N      | N    |
| Select         | E             | E              | G+       | P              | 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              | M      | M            | P         | P         | P                    | P          | VS        | N         | -      | -    |
| Spartan        | M             | P              | P        | G              | G               | F         | G            | P       | F              | E      | E            | P         | 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              | P      | P            | F         | F+        | F+                   | P          | -         | -         | -      | S    |
| Curtail M      | P             | P              | P        | G+             | F               | G         | G            | G+      | G              | F      | 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             | E              | E        | E              | E               | E         | E            | E       | E              | 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              | P      | P            | G         | G         | E                    | P          | -         | -         | S      | -    |
| Beyond*        | G             | F              | F        | G+             | E               | E         | M            | E       | F              | G      | P            | E         | E         | M                    | P          | VS        | -         | VS     | -    |

\*Herbicide Resistant Crop Only





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