

# WEED CONTROL IN SUNFLOWER

(Beverly R. Durgan)

## Cultural Practices

**SF1.** Harrowing and cultivation are important methods of weed control in sunflowers. Since sunflowers normally do not emerge for ten days to two weeks after planting, shallow tillage with a spike tooth, harrow, a coil spring harrow, or a rotary hoe can be used about one week after planting to kill many weeds. Because sunflower seedlings are strongly rooted, these implements can also be used after the sunflowers emerge. However, the tillage implements must be properly adjusted, and tillage after sunflower emergence should be delayed until the sunflower seedlings have two or more leaves. Harrowing may normally be done several times if weeds continue to emerge and if field conditions are suitable. Weeds missed by early tillage may be controlled by cultivation between the rows.

## Herbicides

- SF2.** Weed identification should be the first step in effective weed control. After weeds are identified, select the best method for control. If sunflower fields have several weed species or hard-to-control weeds, a combination of two herbicides is often more effective than one. Herbicide costs can be reduced by applying herbicides in a band over the sunflower row. However, timely cultivation is then needed to control weeds between the rows. Accurate calibration of your spray equipment can also help reduce herbicide costs. Under-application of an herbicide is costly due to ineffective weed control. Applying more herbicide than necessary adds to your herbicide costs, and may also result in sunflower injury.
- SF3.** Proper herbicide application and favorable soil and weather conditions are necessary for optimum performance of soil applied herbicides. The soil should be dry enough to be easily worked, not wet or cloddy, to ensure maximum mixing of the herbicide with the soil during preplant herbicide incorporation. Adequate soil moisture is needed to ensure good herbicide activity. Dry conditions at the point where the germinating weed seedlings contact the herbicide will reduce effectiveness.
- SF4.** **Assert (imazamethabenz)** can be applied postemergence for wild mustard control in sunflower. For wild mustard control, apply imazethabenz at 0.6 to 0.8 pts/A when the majority of wild mustard plants are in the rosette stage and prior to bloom. Assert must always be applied with a nonionic surfactant at a rate of 2 pts/A.
- SF5.** **Assure II\* (quizalofop)** applied at 0.034 to 0.069 lb ai/A (5 to 10 oz/A) will give good control of annual grasses and suppression of quackgrass. A crop oil concentrate at 1% v/v or a nonionic surfactant at 0.25% v/v must always be added to the spray solution. However, **Do Not** use vegetable oil as an additive, since control will be reduced compared to other additives.
- SF6.** **Beyond (imazomox)** is labeled for use on Clearfield Sunflower varieties only. **Do Not** apply to non-labeled varieties. Apply Beyond postemergence to actively growing 3 inch tall weeds at 0.03 lb ai/A (3 oz/A) for control of several annual grasses and broadleaf weeds. A nonionic surfactant at 0.25% v/v and either a liquid fertilizer at 1 to 2.5% v/v or ammonium sulfate at 5 to 15 lbs per 100 gal of spray solution is required.
- SF7.** **Dual Magnum\* (s-metolachlor)** can be applied preplant incorporated or preemergence for annual grass and some annual broadleaf weed control. Wild oat control is poor. Rate is dependent on soil type. Dual Magnum will give early season control of eastern black and hairy nightshade.
- SF8.** **EPTC (Eptam, Eptam 20G)** can be applied preplant incorporated in the fall or spring for annual grass control. **Do Not** apply Eptam 20 G in the spring. Wild oat control is generally not adequate. EPTC is volatile, therefore, it needs to be incorporated immediately after application to prevent herbicide loss. Rate is dependent on soil type, see label.
- SF9.** **Express (tribenuron)** is labeled for use on ExpressSun Sunflower varieties only. **Do Not** apply to non-labeled varieties.
- SF10.** **Gramoxone Inteon/Gramoxone Max (paraquat)** may be applied preplant or anytime prior to sunflower emergence to control emerged annual grasses and broadleaf weeds. Paraquat has no soil residual. Apply with a nonionic surfactant. **Restricted use herbicide.**
- SF11.** **Poast (sethoxydim)** at 0.09 to 0.5 lb/A (0.5 to 2.5 pts/A) will give good control of annual grasses and suppression of perennial grasses. Sunflowers have good tolerance to sethoxydim. An oil concentrate at 1 qt/A must be used for consistently good grass control. Sethoxydim will not control broadleaf weeds.
- SF12.** **Prowl\* (pendimethalin)** may be applied preplant incorporated in the fall or spring to control annual grasses and some broadleaf weeds. Wild mustard and wild oats control is not satisfactory. Rate is dependent on soil type. Pendimethalin can be tank mixed with EPTC (Eptam) in the fall only. Prowl can be applied preemergence to no-till sunflowers. Apply immediately after planting or up to 30 days before planting. **Do Not** apply to emerged sunflowers.
- SF13.** **Spartan (sulfentrazone)** is labeled for soil applied control of several small seeded broadleaf weeds. **Do Not** apply Spartan after the sunflowers have emerged. Best herbicide activity occurs if Spartan is applied to moist soil and followed by approximately 1 inch of rainfall. One to two inches of rainfall is required on dry soil. Rate is dependent on soil type.
- SF14.** **clethodim\* [Select Max/Intensity One** at 0.068 to 0.09 lb/A (9-12 oz/A) or **Arrow/Intensity** at 0.063 to 0.078 lb/A (4-5 oz/A)] will give good control of annual grasses and suppression of perennial grasses.

\* or generic equivalent.

Sunflower has good tolerance to clethodim. Check label for adjuvant rates and recommendations..

- SF15. Sonalan (ethalfluralin)** can be applied preplant incorporated for control of annual grasses and common lambsquarters, kochia and pigweed. Wild oat control is not adequate. Ethalfluralin has not given satisfactory wild mustard control. Rate is dependent on soil type.
- SF16. Treflan\* (trifluralin)** may be applied preplant incorporated in the fall or spring to control annual grasses and some broadleaf weeds. Wild mustard and wild oats control is not satisfactory. Rate is dependent on soil type. Trifluralin can be tank mixed with EPTC (Eptam).
- SF17. Ethalfluralin (Sonalan), pendimethalin (Prowl\*), and trifluralin (Treflan\*)** are all chemically related herbicides called dinitroanilines. Under cold or dry soil conditions these herbicides may persist for more than one year. Sensitive crops such as small grains, grain sorghum, or sugarbeets can be affected the following year. Moldboard plowing reduces the potential of crop injury from residues of these herbicides. Read the label for additional recropping restrictions.

### Desiccants

- SF18. Gramoxone Inteon/Gramoxone Max (paraquat)** may be used as a desiccant. **Do Not** apply until sunflowers have reached physiological maturity (35 percent moisture). Always apply with a nonionic surfactant. **Do Not** graze or feed treated forage. **Paraquat is a restricted use herbicide.**
- SF19. Defol 6\* (sodium chlorate)** may also be used as a desiccant in sunflowers. Apply in at least 5-10 gallons of water per acre by air or 20-30 gallons of water per acre by ground application. Larger spray volumes will result in more complete coverage and more reliable desiccation. Apply 7 or more days before harvest. Desiccation may be slowed under cool conditions. **Do Not** mix with any other pesticide. **Do Not** graze treated fields or feed treated forage within 14 days of application.

\* or generic equivalent.

**Table SF1. Crop Stage and Harvest Restrictions for Sunflowers**

Herbicide Name	Minimum Crop Stage	Maximum Crop Stage	Grain Harvest Restriction (days)
<b><u>Conventional Sunflower</u></b>			
Arrow (clethodim)	none	none	70
Assert (imazamethabenz)	2-leaf	6 leaf	none
Assure II (quizalofop)	none	none	60
Charger Basic (s-metolachlor)	n.a.	n.a.	none
Dual Magnum (s-metolachlor)	n.a.	n.a.	none
Eptam (EPTC)	n.a.	n.a.	none
Intensity (clethodim)	none	none	70
Intensity One (clethodim)	none	none	70
Pendant (pendimethalin)	n.a.	n.a.	none
Pendimax (pendimethalin)	n.a.	n.a.	none
Poast (sethoxydim)	none	none	70
Prowl (pendimethalin)	n.a.	n.a.	none
Prowl H20 (pendimethalin)	n.a.	n.a.	none
Section (clethodim)	none	none	70
Select Max (clethodim)	none	none	70
sodium chlorate, others (sodium chlorate)	n.a.	n.a.	7 to 10
Sonalan (ethalfluralin)	n.a.	n.a.	none
Spartan (sulfentrazone)	n.a.	n.a.	see label
Stealth (pendimethalin)	n.a.	n.a.	none
Targa (quizalofop)	none	none	60
trifluralin, generic (trifluralin)	n.a.	n.a.	none
<b><u>Clearfield Sunflower</u></b>			
Beyond (imazamox)	2 leaf	8 leaf	none
<b><u>ExpressSun Sunflower</u></b>			
Express (tribenuron)	1 leaf	prior to bud formation	70

**Table SF2. Summary of herbicides for use in Sunflowers**

<u>ApplicationType</u>			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<b><u>Conventional Sunflower</u></b>			
<b><u>Burndown</u></b>			
Duramax 4 S	12 to 24 oz	-	Apply prior to sunflower emergence. See individual labels for adjuvant recommendations and specific rates based on weed species and size.
Durango DMA 4 S	12 to 24 oz		
Makaze 3 S	12 to 32 oz		
Roundup Original MAX 4.5 S	11 to 22 oz		
Roundup PowerMAX 4.5 S	11 to 22 oz		
Roundup WeatherMAX 4.5 S	11 to 22 oz		
RT 3 4.5 S (glyphosate)	11 to 22 oz (0.38 to 0.75 lb ai/A)		
Gramoxone Inteon 2 S	2.5 to 4 pts	-	Apply before, during , or after planting but before crop emergence.
Gramoxone Max 3 S (paraquat)	1.7 to 2.7 pts (0.62 to 1.0 lb ai/A)		
Touchdown Hi-Tech 5 L	10 to 25 oz	-	Emerged grasses and broadleaf weeds. Preplant or any time prior to crop emergence
Touchdown Total 4.17 L (glyphosate)	10 to 27 oz (0.39 to 1 lb ai/A)		
<b><u>Preplant Incorporated</u></b>			
Charger Basic 7.62 E (s-metolachlor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type.
Dual Magnum 7.62 E (s-metolachlor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type. Can be applied PPI in fall.
Eptam 20 G Eptam 7 E (EPTC)	10 to 22.5 lbs 2.5 to 5.25 pts (2 to 4.5 lb ai/A)	G	Apply preplant incorporated in spring to control annual grassy weeds and some broadleaf weeds. No wild mustard control. Rate is dependent on soil type. Apply fall incorporated after October 15 until soil freeze-up. No wild mustard control. Controls annual grassy weeds and some broadleaf weeds. Higher rates are for fall application only.
Pendant 3.3 E (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	G	Apply preplant incorporated in the fall or spring to control annual grasses and some broadleaf weeds. Rate dependent on soil type and time of application. Preemergence in no till.
Pendimax 3.3 E (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	G	Apply preplant incorporated in the fall or spring to control annual grasses and some broadleaf weeds. Rate dependent on soil type and time of application. Preemergence in no till.
Prowl 3.3 E (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	G	Apply preplant incorporated in the fall or spring to control annual grasses and some broadleaf weeds. Rate dependent on soil type and time of application. Preemergence in no till.
Prowl H20 3.8 CS (pendimethalin)	1.5 to 3 pts (0.7 to 1.4 lb ai/A)	G	Apply preplant incorporated in the fall or spring to control annual grasses and some broadleaf weeds. Rate dependent on soil type and time of application. Preemergence in no till.

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<u>Application Type</u>			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<b><u>Conventional Sunflower</u></b>			
<b><u>Preplant Incorporated</u></b>			
<b>Sonalan 10 G</b>	5.5 to 11.5 lbs	G	Apply preplant incorporated for the control of annual grassy weeds and some broadleaf weeds. Weak on wild mustard. See narrative for recropping restrictions. Rate is dependent on soil type.
<b>Sonalan 3 E</b> (ethalfluralin)	1.5 to 3 pts (0.57 to 1.12 lb ai/A)		
<b>Spartan 4 F</b>	3 to 6 oz	G	Apply preplant, preplant incorporated, or preemergence. Controls nightshade and pigweed species. Do Not apply after sunflower emergence. Rate is dependent on soil type.
<b>Spartan 75 DF</b> (sulfentrazone)	2 to 4 oz (0.094 to 0.188 lb ai/A)		
<b>Stealth 3.3 E</b> (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	F/G	Apply preplant incorporated in the fall or spring to control annual grasses and some broadleaf weeds. Rate dependent on soil type and time of application. Preemergence in no till.
<b>trifluralin 10 G</b>	5 to 10 lb	G	Apply preplant incorporated to control annual grassy weeds and some broadleaf weeds. Weak on wild mustard control. Apply preplant incorporated in the fall after September 1. Weak on wild mustard control.
<b>trifluralin 4 E</b> (trifluralin)	1 to 2 pts (0.5 to 1 lb ai/A)		
<b><u>Preemergence</u></b>			
<b>Charger Basic 7.62 E</b> (s-metolachlor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type.
<b>Dual Magnum 7.62 E</b> (s-metolachlor)	1 to 2 pts (0.96 to 1.91 lb ai/A)	G	Rate dependent on soil type.
<b>Pendant 3.3 E</b> (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	G	Apply preemergence to control annual grasses and some broadleaf weeds. Rate dependent on soil type and time of application.
<b>Pendimax 3.3 E</b> (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	G	Apply preemergence to control annual grasses and some broadleaf weeds. Rate dependent on soil type and time of application.
<b>Prowl 3.3 E</b> (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	G	Apply preemergence to control annual grasses and some broadleaf weeds. Rate dependent on soil type and time of application.
<b>Prowl H20 3.8 CS</b> (pendimethalin)	1.5 to 3 pts (0.7 to 1.4 lb ai/A)	G	Apply preemergence to control annual grasses and some broadleaf weeds. Rate dependent on soil type and time of application.
<b>Spartan 4 F</b>	3 to 6 oz	G	Apply preplant, preplant incorporated, or preemergence. Controls nightshade and pigweed species. Do Not apply after sunflower emergence. Rate is dependent on soil type.
<b>Spartan 75 DF</b> (sulfentrazone)	2 to 4 oz (0.094 to 0.188 lb ai/A)		
<b>Stealth 3.3 E</b> (pendimethalin)	1.2 to 3.6 pts (0.5 to 1.5 lb ai/A)	G	Apply preemergence to control annual grasses and some broadleaf weeds. Rate dependent on soil type and time of application.
<b><u>Postemergence</u></b>			

**Table SF2. Summary of herbicides for use in Sunflowers**

<u>Application Type</u>			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
<b><u>Conventional Sunflower</u></b>			
<b><u>Postemergence</u></b>			
<b>Arrow 2 EC</b> (clethodim)	6 to 16 oz/A (0.094 to 0.25 lb ai/A)	G	Controls annual grasses and suppresses quackgrass. Apply when grasses are 2-8 inches and actively growing. Always add COC at 1-2 pts/A. AMS at 2.5 lb/A is recommended.
<b>Assert 2.5 E</b> (imazamethabenz)	0.6 to 0.8 pts (0.19 to 0.25 lb ai/A)	G/F	Apply 0.6 to 0.8 pts for wild mustard control (rosette to bloom stage). Always apply Assert with a nonionic surfactant at 2 pts/A. See narrative for crop rotation restrictions. Do Not tank mix with other herbicides or insecticides.
<b>Assure II 0.88 E</b> (quizalofop)	5 to 10 fl oz (0.034 to 0.069 lb ai/A)	G	Controls annual grass and suppresses quackgrass. Apply when annual grasses are 2 to 6 inches tall or 6 to 10 inch quackgrass. Nonionic surfactants at 1 quart per 100 gal. of spray solution (0.25%) is the preferred adjuvant for sunflowers.
<b>Intensity 2 EC</b> (clethodim)	6 to 16 oz (0.094 to 0.25 lb ai/A)	G	Controls annual grasses and suppresses quackgrass. Apply when grasses are 2-8 inches and actively growing. Always add COC at 1-2 pts/A. AMS at 2.5 lb/A is recommended.
<b>Intensity One 0.97 EC</b> (clethodim)	0.56 to 0.75 pt (0.068 to 0.09 lb ai/A)	G	Controls annual grasses and suppresses quackgrass. Apply when grasses are 2-8 inches and actively growing.
<b>Poast 1.5 E</b> (sethoxydim)	0.5 to 2.5 pts (0.9 to 0.5 lb ai/A)	G	Controls annual grasses and suppresses quackgrass. For best results apply when grasses are 2 to 6 inches and actively growing. Quackgrass may require two applications. Always add an oil concentrate.
<b>Section 2 EC</b> (clethodim)	6 to 16 oz (0.094 to 0.25 lb ai/A)	G	Controls annual grasses and suppresses quackgrass. Apply when grasses are 2-8 inches and actively growing. Always add COC at 1-2 pts/A. AMS at 2.5 lb/A is recommended.
<b>Select Max 0.97 EC</b> (clethodim)	9 to 12 fl oz (0.068 to 0.09 lb ai/A)	G	Controls annual grasses and suppresses quackgrass. Apply when grasses are 2-8 inches and actively growing.
<b>Targa 0.88 E</b> (quizalofop)	5 to 10 fl oz (0.034 to 0.069 lb ai/A)	G	Controls annual grass and suppresses quackgrass. Apply when grasses are 2 to 6 inches tall. Nonionic surfactants at 1 quart per 100 gal. of spray solution (0.25%) is the preferred adjuvant for sunflowers.
<b><u>Dessicants</u></b>			
<b>Gramoxone Inteon 2 S</b> <b>Gramoxone Max 3 S</b> (paraquat)	1.2 to 2 pts 0.8 to 1.3 pts (0.3 to 0.5 lb ai/A)	-	Apply with nonionic surfactant. Apply when sunflowers have reached physiological maturity. Restricted use herbicide.
<b>sodium chlorate, others</b> (sodium chlorate)	4 qts (6 lb ai/A)	-	Thorough coverage is essential. Make application 7 or more days before harvest. Do Not graze or harvest treated foliage within 14 days.
<b><u>Clearfield Sunflower</u></b>			
<b><u>Postemergence</u></b>			
<b>Beyond 1 S</b> (imazamox)	4 oz (0.3 lb ai/A)	G	Apply from the 2 leaf to 8 leaf stage. Apply to Clearfield Sunflower varieties only. Apply postemergence for control of annual grasses and broadleaf weeds. A nonionic surfactant at 0.25 % v/v and either a liquid fertilizer at 1 to 2.5% v/v or ammonium sulfate at 5 to 15 lbs per 100 gals of spray solution is required.

**Table SF2. Summary of herbicides for use in Sunflowers**

<u>ApplicationType</u>		Crop	
Herbicide / Formulation	Rate Range	Tolerance	Remarks
<b><u>ExpressSun Sunflower</u></b>			
<b><u>Postemergence</u></b>			
<b>Express 50 SG</b> (tribenuron)	0.25 to 0.5 oz (0.008 to 0.016 lb ai/A)	G	Apply from the 1-leaf stage to prior to bud formation. Do not apply more than 1.0 oz/A postemergence during the same sunflower growing season. Application to non-ExpressSun trait sunflower may cause severe crop injury or death of the plant.

**Table SF3. Effectiveness of herbicides on major weeds in Sunflowers**

Herbicides	Grasses				Broadleaves						
	Giant Foxtail	Green Foxtail	Yellow Foxtail	Wild Oats	Cocklebur	Common Lambsquarters	Common Ragweed	Kochia	Pigweed spp.	Smartweeds (annual)	Wild Mustard
<b>Conventional Sunflower</b>											
<b>Preplant Incorporated</b>											
Charger Basic (s-metolachlor)	G	G	G	G	P	F	P	P	G	P	P
Dual Magnum (s-metolachlor)	G	G	G	G	P	F	P	P	G	P	P
Eptam (EPTC)	G	G	G	F	P	F	F	F	F	P	P
Pendant (pendimethalin)	G	G	G	P	N	G	P	G	G	F	P
Pendimax (pendimethalin)	G	G	G	P	N	G	P	G	G	F	P
Prowl (pendimethalin)	G	G	G	P	N	G	P	G	G	F	P
Prowl H20 (pendimethalin)	G	G	G	P	N	G	P	G	G	F	P
Sonalan (ethalfluralin)	G	G	G	F	N	G	N	G	G	P	N
Spartan (sulfentrazone)	F/P	F/P	F/P	P	P	G	P	G	G	F	P
Stealth (pendimethalin)	G	G	G	P	N	G	P	G	G	F	P
trifluralin, generic (trifluralin)	G	G	G	P	N	G	N	G	G	P	N
<b>Preemergence</b>											
Charger Basic (s-metolachlor)	G	G	G	G	P	F	P	P	G	P	P
Dual Magnum (s-metolachlor)	G	G	G	G	P	F	P	P	G	P	P
Pendant (pendimethalin)	G	G	G	P	N	G	P	G	G	F	P
Pendimax (pendimethalin)	G	G	G	P	N	G	P	G	G	F	P
Prowl (pendimethalin)	G	G	G	P	N	G	P	G	G	F	P
Prowl H20 (pendimethalin)	G	G	G	P	N	G	P	G	G	F	P
Spartan (sulfentrazone)	F/P	F/P	F/P	P	P	G	P	G	G	F	P
Stealth (pendimethalin)	G	G	G	P	N	G	P	G	G	F	P
<b>Postemergence</b>											
Arrow (clethodim)	G	G	G	G	N	N	N	N	N	N	N
Assert (imazamethabenz)	N	N	N	G	N	N	N	F	N	P	G
Assure II (quizalofop)	G	G	G	G	N	N	N	N	N	N	N
Intensity (clethodim)	G	G	G	G	N	N	N	N	N	N	N
Intensity One (clethodim)	G	G	G	G	N	N	N	N	N	N	N
Poast (sethoxydim)	G	G	G	G	N	N	N	N	N	N	N
Section (clethodim)	G	G	G	G	N	N	N	N	N	N	N
Select Max (clethodim)	G	G	G	G	N	N	N	N	N	N	N
Targa (quizalofop)	G	G	G	G	N	N	N	N	N	N	N
<b>Clearfield Sunflower</b>											
<b>Postemergence</b>											
Beyond (imazamox)	G	G	G	G	G	G	F	G	G	G	G
<b>ExpressSun Sunflower</b>											
<b>Postemergence</b>											
Express (tribenuron)	N	N	N	N	G	G	F	G	G	G	G

NOTE: G = Good; F= Fair; P = Poor; N = No control. Effectiveness ratings apply if herbicide is used according to label recommendations as to rate, time of application, etc., and favorable temperature and moisture conditions prevail.