

Herbicides for Weed Control in Sugar Beets

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INTRODUCTION

Herbicides play an important role for weed control in sugar beet production. Until sugar beets become established, they are very susceptible to competition from weeds. That is one reason why many growers like to use preplant or preemergence herbicides. Early postemergence herbicide applications also help reduce competition from weeds while the sugar beets are small. Using herbicides for weed control must be considered just one of the tools in a weed management program. Some of the other weed management tools that can be used in sugar beet production include cultural and physical or mechanical practices.

Cultural weed control practices involve manipulating the crop and weed relationship to favor the crop at the expense of the weed. It can be one of the least expensive practices and can mean the difference between success or failure in a weed management program. Crop rotation is a cultural weed control practice that reduces or prevents the infestation of certain types of weeds species. This is because weeds of similar growth habit are generally the most competitive with the crop. Growth habit may include time of emergence relative to the crop, whether it is a grass or broadleaf, and what type of growth it may have.

Physical and/or mechanical weed control includes hand-weeding and cultivation. Hand-weeding can be costly and time consuming. Many growers today have moved away from hand-weeding because of the availability of hand labor. Hand-weeding and cultivation can be very effective for annual and biennial weed control, but is generally ineffective for perennial weed control. Cultivation prior to planting is an effective weed control tool, as well as burying crop residue and preparing the seedbed.

Selecting which herbicide to use for weed control in sugar beets is just like selecting herbicides for weed control in any other crop. Herbicide selection depends on the weed species to be controlled.

Factors important in choosing a herbicide include:

- Label approval for use
- Weed species present
- Soil texture, pH, and organic matter
- Tillage practices
- Irrigation practices
- Application and incorporation equipment available
- Herbicide performance
- Herbicide cost
- Potential for drift
- Potential for soil residues that may affect other crops in the rotation

Herbicides registered for use in sugar beets can be applied preplant incorporated, preemergence, postemergence, or lay-by to the crop. Some herbicides can be used preplant or postemergence, while others can only be used postemergence or lay-by. It is important to **always read the herbicide label** before using a herbicide.

HOW TO USE THIS GUIDE

This guide is intended to help users of herbicides make better decisions for selecting the herbicide(s) that will give them the most benefit for weed control. It does not contain all of the information listed on a herbicide label. This guide is divided into categories of application timing, i.e., preplant and preemergence, postemergence, and lay-by. Since some herbicides can be used at more than one timing of application, listings of those herbicide can be found in more than one section. Many of the herbicides applied with ground sprayers are applied in a band. The application rates used in this guide are listed in 5-inch and 7-inch bands, as well as a broadcast rate.

Preplant Incorporated and Preemergence Herbicides

Roundup Ultra and Roundup Ultra RT glyphosate (4 lb ai/gal)

Rate:

7-inch band	2.6 to 15.8 fl oz/A
Broadcast	8 to 48 fl oz/A (0.25 to 1.5 lb ai/A)

Timing:

Apply postemergence to the weeds, but preplant or preemergence to the sugar beets. All treatments must be made before the crop emerges, or crop injury will result.

Remarks:

Seedbeds formed ahead of treatment will permit maximum weed emergence prior to sugar beet emergence. Roundup controls only emerged weeds and does not provide residual weed control. Care must be taken to apply before sugar beets emerge. Do not plant subsequent crops other than those listed on the label for 30 days following application. Heavy rainfall immediately after application may reduce weed control.

Gramoxone Extra

paraquat (2.5 lb ai/gal)

Rate:

7-inch band	8 to 16 fl oz/A + nonionic surfactant or crop oil concentrate
Broadcast	1.5 to 3 pints/A (0.47 to 0.94 lb ai/A) + nonionic surfactant or crop oil concentrate

Timing:

Apply postemergence to weeds but prior to crop emergence.

Remarks:

Seedbeds formed ahead of treatment will permit maximum weed emergence prior to sugar beet emergence. Flat fan nozzles result in the most effective weed control. Do not apply to pure sand soils. Cool and/or cloudy weather will slow the activity of Gramoxone Extra, but not its performance. Rainfall within 30 minutes of application will result in unsatisfactory control.

Caution:

Gramoxone Extra is a **Restricted Use Herbicide**. Wear protective clothing when handling and spraying. Avoid contact with eyes and skin. Do not breathe spray mist.

Nortron SC

ethofumesate (4 lb ai/gal)

Rate:

7-inch band	12.0 to 40 fl oz/A
Broadcast	2.25 to 7.5 pints/A (1.12 to 3.0 lb ai/A)

Timing:

Nortron may be applied in the fall. See *Remarks* for specific instructions.

Sprinkler irrigation: Apply preemergence at the time of planting or shortly after, and irrigate prior to crop and weed germination. Apply at least 0.5-inch of water during first irrigation. Repeat irrigation as necessary to maintain good moisture in the upper soil layer.

Furrow irrigation: Apply preplant or at time of planting, but prior to weed germination, and incorporate into the soil. Where sugar beets are grown in beds apply after bedding and incorporate.

Remarks:

For fall applications, apply in a band to the soil surface. Cover the treated bands with soil to form beds or ridges. In the spring, de-ridge the beds down to within 0.5 to 1 inch of treated layer. Plant sugar beets in the de-ridged area. Do not broadcast-spray Nortron because increased soil residue will increase chances of injury to following crops. See label for rate best suited to soil type.

Sprinkler irrigation: Do not mechanically incorporate.

Furrow irrigation: Since Nortron SC requires moisture to control weeds, irrigate until the tops of beds are thoroughly wetted.

Caution:

Temporary injury may occur at higher rates. Do not plant any other crop within 12 months after application when using soil-applied. May rotate 6 months after low-rate postemergence applications. Do not mix with liquid fertilizers. Soil should be moldboard-plowed the next year before planting other crops.

Pyramin DF

pyrazon (0.68 lb ai/lb)

Rate:

7-inch band	1.55 to 1.7 lb/A
Broadcast	4.6 to 5.4 lb/A (3.25 to 3.86 lb ai/A)

Timing:

Sprinkler irrigation: Band apply within 3 days after planting and water with no more than 0.75-inch of water.

Furrow irrigation: Apply preplant to prepared seedbeds and incorporate.

Remarks:

Application rate depends on soil type. Use the low rate (1.55 lb/A 7-inch band) on low organic matter (< 3%) soils and sandy loam soils. The higher rate (1.7 lb/A 7-inch band) can be used on loam and clay soils.

Sprinkler irrigation: Avoid applying more than 0.75-inches of water per irrigation until the sugar beets emerge and have 2 true leaves. Do not mechanically incorporate. Sprinkler irrigation and mechanical incorporation together increases injury potential.

Furrow irrigation: Incorporate no more than 2 inches deep with a rotary-type incorporator. Plant sugar beets and furrow-irrigate until the tops of the beds are thoroughly wetted.

Caution:

Do not use as a broadcast treatment in dry irrigated areas. Do not use on sand or loamy sands. Early crop injury may occur at high rates or with excessive irrigation.

Ro-Neet

cycloate (6 lb ai/gal)

Rate:

7-inch band	21.3 to 28.6 fl oz/A
Broadcast	0.5 to 0.67 gal/A

Timing:

Apply preplant incorporated in the fall (0.67 gal/A) or spring. If applied in the fall, do not reapply preplant the next spring. Fall applications should be made before soils freeze, but after soil temperatures have declined to reduce microbial activity. This temperature is generally considered below 50 F.

Remarks:

Use the lighter application rate on sandy soils. Ro-Neet must be incorporated 2 to 3 inches deep immediately after application. For maximum weed control, plant sugar beets immediately after application. Firm the soil after incorporation to reduce moisture loss. Injury may result in highly saline or alkaline soils. When cultivating fields where Ro-Neet has been banded in the row, use shields to prevent movement of untreated soil into the treated row. Ro-Neet may be applied with fluid fertilizers or impregnated on dry bulk fertilizers.

Postemergence Herbicides

Betamix

desmedipham & phenmedipham (1.3 lb ai/gal)

Rate:

Micro rate	8 fl oz/A at the cotyledon to 4 leaf stage 8 to 12 fl oz/A past the 4 leaf stage
7-inch band	10.2 to 15.3 fl oz/A at the cotyledon to 2 leaf stage 22.9 to 38.2 fl oz/A past the 2 leaf stage
Broadcast	2 to 3 pt/A (0.25 to 0.33 lb ai/A) at the cotyledon to 2 leaf stage 4.5 to 7.5 pt/A (0.3 to 0.5 lb ai/A) past the 2 leaf stage

Timing:

Multiple low rate (10.2 to 15.3 fl oz/A 7-inch band) and micro rate applications may be applied to control early germinating weeds. Apply when earliest emerging weeds have reached the cotyledon size. Apply micro rates 3 to 5 times at 5 day intervals and low rates 2 to 3 times at 7 day intervals. The first application may be made when sugar beets are in cotyledon to 1 leaf stage, but weeds must have no more than 1 true leaf. Higher rates (22.9 to 38.2 fl oz/A 7-inch band) are required when weeds are in 2 to 4 leaf stage, but in such a case sugar beets must have at least 2 true leaves, and temperatures must be between 50 and 80 F.

Remarks:

Controls common lambsquarters, nightshades, mustards, and annual sowthistle. Some control of green foxtail, but weak on pigweeds. May be tank mixed with Nortron SC or Poast. Consult the label for application rates and timing. Rainfall within 6 hours of application will result in unsatisfactory control. If using micro rates, include methylated seed oil (MSO) at 1.5% v/v or at least 1 pint/A.

Caution:

When air temperature is or is likely to be above 80 F on the day of spraying, delay application of standard rates until evening when the temperature is lower. Do not spray while dew is present. Do not exceed 12 pints/A in a growing season. Do not apply later than 75 days before harvest. Do not apply Betamix through any irrigation system. Do not add wetting agents or spray adjuvants.

Progress

phenmedipham, desmedipham, and ethofumesate (1.8 lb ai/gal)

Rate:

Micro rate	5.7 fl oz/A at the cotyledon to 4 leaf stage 5.7 to 8.7 fl oz/A past the 4 leaf stage
Multiple (low rate) applications	
7-inch band	5.7 to 7.6 fl oz/A at the cotyledon 6.8 to 11.4 fl oz/A at the 2 leaf 7.6 to 16.5 fl oz/A at the 4 leaf
Broadcast	1.13 to 1.5 pt/A (0.25 to 0.33 lb ai/A) at the cotyledon 1.33 to 2.25 pt/A (0.3 to 0.5 lb ai/A) at the 2 leaf 1.5 to 3.25 pt/A (0.33 to 0.73 lb ai/A) at the 4 leaf
Conventional applications	
5-inch band	11.8 to 18.2 fl oz/A past the 2 leaf
7-inch band	16.5 to 25.5 fl oz/A past the 2 leaf
Broadcast	3.25 to 4.5 fl oz/A past the 2 leaf

Timing:

Micro rate and multiple low rate applications may be applied to control early germinating weeds. Apply when earliest emerging weeds have reached the cotyledon size. Higher rates (16.5 to 25.5 fl oz/A 7-inch band) without MSO can be applied when the sugar beets have at least 2 true leaves and weeds are in 2 to 4 leaf stage.

Remarks:

Apply micro rates 3 to 5 times at 5 day intervals and low rates 2 to 3 times at 7 day intervals. Air temperatures must be between 50 and 80 F. Betamix Progress can be applied by air using 5 to 15 gallons of spray per acre. Rainfall within 6 hours of application will result in unsatisfactory control. If using micro rates, include methylated seed oil (MSO) at 1.5% v/v or at least 1 pint/A.

Caution:

When air temperature is or is likely to be above 80 F on the day of spraying, delay application until evening when the temperature is lower. Do not exceed 8.7 pints/A in a growing season. Do not apply later than 75 days before harvest. Do not apply Betamix Progress through any irrigation system.

Pyramin DF

pyrazon (0.68 lb ai/lb)

Rate:

7-inch band	1.5 to 1.8 lb/A
Broadcast	4.8 to 5.7 lb/A (3.25 to 3.86 lb ai/A)

Timing:

Treat after the sugar beets have 2 expanded true leaves and before any weeds have emerged.

Remarks:

Treatments on emerged weeds will not be effective. Good soil moisture prior to treatment is necessary. If soil is dry, irrigation is recommended prior to chemical application. For optimum performance, a postemergence application should be followed with moisture. With furrow irrigation, water shortly after application to the point that bed surface has reached maximum water-holding capacity. If sprinkler irrigation is used, do not apply more than 0.75-inch of water on the first set after application. Postemergence applications can follow preemergence Pyramin applications provided a total of 11.25 lb/A per season is not exceeded.

Caution:

Increased temporary sugar beet injury has been observed where postemergence Pyramin applications have followed preplant Ro-Neet applications.

Stinger

clopyralid (3 lb ae/gal)

Rate:

7-inch band	1.27 to 3.4 fl oz/A
Broadcast	0.25 to 0.66 pt/A (0.094 to 1.88 lb ae/A) For Canada thistle control use 0.5 to 0.66 pt/A
Micro rate	1.33 fl oz/A applied with Betamix or Progress

Timing:

Apply to sugar beets from the two to 8 true leaf stage. For Canada thistle control, apply after the majority of basal leaves have emerged but prior to bud stage.

Remarks:

May be tank mixed with Betamix, Progress, or Poast to control additional weeds. Do not add surfactant or other adjuvants when tank mixing with Betamix or Betamix Progress and using higher than micro rates. When tank mixing with Poast, be sure to include crop oil or Dash surfactant. For most effective control of Canada thistle, apply as a broadcast treatment to the entire infested area. Make applications at 10 or more gallons of total spray volume. Re-treat as necessary but do not exceed 0.66 pt/A per year. Rainfall within 8 hours of application will result in unsatisfactory control.

Caution:

In areas receiving less than 18 inches average annual precipitation (not including irrigation), do not plant alfalfa, dry beans, sunflower, peas, potatoes, or broadleaf crops grown for seed (excluding *Brassica* species) for 18 months after application. Do not apply within 105 days before harvest of beet roots and tops. Do not apply by aircraft.

UpBeet

triflusulfuron (0.5 lb ai/lb)

Rate:

7-inch band	0.167 oz/A
Broadcast	0.5 oz/A (0.25 oz ai/A)
Micro rate	0.167 oz/A applied with Betamix or Progress

Timing:

Apply when earliest emerging weeds have reached the cotyledon to 2 leaf size. Two close sequential applications give the best control of weeds present at applications. Each application is usually separated by 5 to 15 days.

Remarks:

Effectively controls kochia, redroot pigweed, common lambsquarters, nightshades, and mustards when used in combination with Betamix, Betamix Progress, and/or Stinger. Rainfall within 6 hours of application will result in unsatisfactory control.

Caution:

Applications made when temperatures remain below 59 degrees may result in a temporary yellow appearance. However, this should only be temporary and not reduce beet yields.

Assure II

quizalofop (0.88 lb ai/gal)

Rate:

7-inch band	1.9 to 3.8 fl oz/A
Broadcast	6 to 12 oz/A (0.041 to 0.083 lb ai/A)
Micro rate	4 fl oz/A applied with Betamix or Progress

Timing:

Apply to actively growing grasses. Size limitations varies with grass weed species, but generally requires treatment by about 4 inches tall with 1.9 to 2.5 oz/7-inch band rates.

Remarks:

Consult label for application rates according to species and size. Sugar beets at all stages of growth are tolerant. When applied alone, add crop oil concentrate at 1.25% v/v. Use higher rates when tank mixing with broadleaf herbicides to avoid reduction in grass control. If grass population is high, do not use with micro rate application. Do not cultivate during or within 7 days before or after applying Assure II to avoid unsatisfactory control. Rainfall within 1 hour of application will result in unsatisfactory control.

Caution:

Do not apply to grasses stressed from abnormal weather, drought, water saturated soils, or prior herbicide injury.

Poast

sethoxydim (1.5 lb ai/gal)

Rate:

7-inch band	5.1 to 12.7 fl oz/A
Broadcast	1.0 to 2.5 pints/A (0.19 to 0.47 lb ai/A)
Micro rate	5.3 fl oz/A

Timing:

Apply to actively growing grasses. Size limitations varies with grass weed species, but generally requires treatment by about 4 inches tall with lower use rates.

Remarks:

Consult label for application rates according to species and size. Sugar beets at all stages of growth are tolerant. In irrigated areas, apply 2 to 4 days after irrigation for best results. If grass population is high, do not use with micro rate application. Annual bluegrass and fine fescues are not controlled. Spray volunteer grain up to 4 inches tall but before tillering. Poast will not control volunteer cereals that emerged the previous fall. Can be tank-mixed with Betamix without crop oil concentrate. Do not cultivate within 5 days prior to application or within 7 days following application. A cultivation 14 to 21 days after an initial or sequential application will aid quackgrass control. Rainfall within 1 hour of application will result in unsatisfactory control.

Caution:

Do not apply more than 5 pints of product in 1 year. Do not make the last application within 100 days before harvest if tops are to be fed to livestock.

Select

clethodim (2 lb ai/gal)

Rate:

7-inch band	1.33 to 1.66 fl oz/A
Broadcast	4 to 5 fl oz/A (0.063 to 0.078 lb ai/A)
Micro rate	2 fl oz/A applied with Betamix or Progress

Timing:

Apply to actively growing grasses 1 to 6 inches tall.

Remarks:

Apply when the first grass weed species in a mixed grass weed population reaches the recommended growth stage for treatment. Always use crop oil concentrate at 1% v/v. An additional 1 to 2 qt/A liquid fertilizer (28 or 32% N) or 2.5 to 4 lb

AMS fertilizer may be added for enhanced grass control. Do not apply if rain is expected within 1 hour of application. Refer to label information on tank-mixing with broadleaf herbicides.

Caution:

Do not apply within 30 days of harvesting.

Lay-by Herbicides

Eptam

EPTC (7 lb ai/gal)

Rate:

7-inch band	18.66 fl oz/A
Broadcast	3.5 pints/A (3.0 lb ai/A)

Timing:

Apply after cultivation and thinning and incorporate 2 to 3 inches following application. Do not apply before the first true sugar beet leaves have formed or within 49 days of harvest.

Remarks:

May be incorporated or metered into sprinkler irrigation lines or injected on each side of beet row according to label directions. May be mixed with some liquid fertilizers (see label). Use on mineral soils containing less than 10% organic matter.

Ro-Neet

cycloate (6 lb ai/gal)

Rate:

7-inch band	21.33 fl oz/A
Broadcast	0.5 gal/A

Timing:

Apply after the first true leaves have formed and after thinning and clean cultivation.

Remarks:

Ro-Neet can be applied with a sprayer or through a sprinkler irrigation system. If applied with a sprayer, it must be mechanically incorporated to a depth of 2 to 3 inches or incorporated using 0.5 to 0.75-inch of sprinkler irrigation water, or enough water to penetrate the soil to a depth of 3 to 4 inches. If applied through a sprinkler system, meter sufficient water to penetrate to a depth of 3 to 4 inches. Time the application to insure that proper soil penetration corresponds to the end of the irrigation set.

Caution:

Do not tank mix with Betamix. If applying through an irrigation system, use only a center pivot, lateral move, end tow, wheel line, traveling big gun, solid set, or hand moved lines. The system must meet all of the chemigation application use requirements.

Treflan

trifluralin (4 lb ai/gal or 0.1 lb ai/lb)

Rate:

7-inch band	5.33 to 8 fl oz/A (EC or MTF)
Broadcast	1.0 to 1.5 pints/A (EC or MTF) 5.0 to 7.5 lb/A (TR-10)

Timing:

Apply lay-by when soil has been pushed around beets after thinning (i.e., when beets are 2 to 6 inches tall, or in 4- to 6-leaf stage).

Remarks:

Cover exposed beet roots with soil before application. Does not need irrigation to activate. Incorporate with power tiller, rolling cultivator, or flex tine harrow. After using Treflan, deep-plow before planting any sensitive crop. Do not plant oats. See label for crop rotations restrictions.

Outlook

dimethenamid-P (6 lb ai/gal)

Rate:

7-inch band	4.67 to 6 fl oz/A
Broadcast	14 to 18 fl oz/A (0.65 to 0.84 lb ai/A)

Timing:

Outlook may be applied from the 2 true leaf to 12-leaf growth stage. Two applications per growing season are permitted but may not exceed 21 fluid ounces per growing season.

Remarks:

Outlook is labeled for use in Idaho and eastern Oregon under Section 18 registration. Do not use within 49 days of harvest. Do not apply by irrigation system, other than overhead sprinklers.

Herbicide Effectiveness on Weeds in Sugarbeets

Weeds	cycloate (Ro-Neet)	ethofumesate (Norton)	pyrazon (Pryamin)	phenmedipham + desmedipham (Betamix)	elopyralid (Stinger)	trifluralin (UpBeet) ²	clethodim (Prism)	quizalofop (Assure II)	sethoxydim (Poast)	EPTC lay-by (Eptam)	trifluralin (Treflan)
Barley, volunteer	F	F	P	P	P	P	G	G	P-F	P	P
Barnyardgrass	G	G	P	P-F	P	P	E	E	E	G	G
Bindweed, field	P	P	P	P	P	P	P	P	P	P	P
Buckwheat	P	F-G	P	F-G	E	G	P	P	P	F	F
Clover, sweet	P	F-G	P	P	E	P	P	P	P	P	P
Cocklebur	P	P	P	F	E	F	P	P	P	P	P
Crabgrass	G	F-G	P	P	P	P	E	E	F	G	G
Dodder	P	P	P	P	P	P	P	P	P	P	P
Foxtail	G	G	P	F	P	P	E	E	E	G	G
Knapweed, Russian	P	P	P	P	G	P	P	P	P	P	P
Knotweed	P	P	P	F	F	G	P	P	P	G	G
Kochia	P	F-G	P	P-F	P	G	P	P	P	F	F
Lambsquarters	E	G-E	G	E	F	G	P	P	P	G	F-G
Mallow	P	P	P	P	P	F	P	P	P	P	P
Mustard	P	G	G	G	P	G	P	P	P	P	P
Nightshade, black	G	F-G	F-G	F-G	F-G	G	P	P	P	F-P	P
Nightshade, hairy	G	F-G	F-G	G-E	F-G	F	P	P	P	G	P
Nutsedge, yellow	F	P	P	P	P	P	P	P	P	F	P
Oats, volunteer	F	F	P	P	P	P	G	G-E	P-F	P	P
Oats, wild	F	F	P	P	P	P	G-E	G-E	G-E	F-G	F
Pigweed	E	G-E	G-E	G-E	P	G-E	P	P	P	F-G	G
Purslane	G	F-G	F-G	G	P	F	P	P	P	G	G
Quackgrass	F	P	P	P	P	P	G ³	G ³	F	F	P
Sandbur	G	P	P	P	P	P	E	G	—	G	G
Smartweed	P	F-G	G	P	G	G	P	P	P	P	P-F
Sowthistle	P	G	P	E	G	G	P	P	P	F	P
Sunflower	P	P	P	F	E	P	P	P	P	P	P
Thistle, Canada	P	P	P	P	E	P	P	P	—	P	P
Thistle, Russian	P	F-G	P-F	F	P	P	P	P	P	P	F-G
Wheat, volunteer	F	F	P	P	P	P	G	G	P-F	F	F

E = excellent G = good F = fair P = poor — = limited information

² UpBeet controls these weeds when tank-mixed with Betamix.

³ Requires two applications of Prism or Assure II to control quackgrass.

Response of weeds to any of the listed herbicides may be altered by growing conditions, weed population, type of irrigation, genetic variation, soil type, pH, organic matter, time of application, and application rate. Ratings may vary from season to season and from site to site. Weed control generally decreases as the season progresses.

From: *2003 Pacific Northwest Weed Management Handbook*. 2003. Extension Services of University of Idaho, Oregon State University, and Washington State University (Corvallis: Oregon State University).