

WEED CONTROL IN SUGARBEET

(Alan G. Dexter)

- SU1. Sugarbeet is a poor competitor with weeds** from emergence until the sugarbeet leaves shade the ground. Emerging sugarbeet plants are small, lack vigor and take approximately two months to shade the ground. Thus, weeds have a long period to become established and compete with sugarbeet. Sugarbeet plants are relatively short even after they shade the ground so many weeds that become established in a sugarbeet field prior to ground shading will become taller than the sugarbeet, shade the sugarbeet, and cause severe yield losses. To avoid yield loss from weed competition, weeds should be totally controlled by four weeks after sugarbeet emergence and weed control should be maintained throughout the season.
- SU2. A combination of cultural, chemical, and mechanical weed control methods should be used** to maximize weed control in sugarbeet. Some weed species such as common milkweed, ALS resistant kochia and lanceleaf sage are difficult or impossible to control selectively in sugarbeet with herbicides. These weeds in particular, and all weeds in general, should be effectively controlled in other crops in the rotation. Spot spraying or hand weeding small areas should be used to prevent establishment of problem weeds. Sugarbeet should not be planted on fields badly infested with problem weeds.
- SU3. Cultivation with a row crop cultivator is a universal and essential weed control method** in sugarbeet. Also, the rotary hoe or spring tine harrow can be used to remove small weeds from well-rooted sugarbeet. Hand weeding is still used for weed control in sugarbeet with 30% of the acres in Minnesota and Eastern North Dakota receiving some hand weeding in 2003. The decision on using hand weeding or other methods of weed control should be based on expected economic returns. Generally herbicides will be more cost effective than hand weeding in moderate to heavy weed densities. Hand weeding may be more cost effective in low weed densities, especially if the weeds are expected to be difficult to control with herbicides.

Preemergence Contact or Tillage Substitution Herbicides

- SU4. Glyphosate** can be applied before sugarbeet emerge to emerged weeds at 0.19 to 0.75 lb ai/A. Use the higher rate on larger weeds, less susceptible weeds, or if the plants are under moisture stress. When low rates of glyphosate are used, apply in 3 to 10 gallons of water per acre by ground or in 3 to 5 gpa by air. Delay tillage for at least 3 days after treatment. Add a surfactant to the spray solution. Addition of ammonium sulfate often will increase weed control.
- SU5. Gramoxone Inteon /Gramoxone Max (paraquat)** can be applied at 0.5 to 1.0 lb ai/A before sugarbeet emergence to emerged weeds. Apply in 5 to 10 gpa of water by air or in 20 to 60 gpa by ground. Add a surfactant to the spray solution. Paraquat is corrosive to exposed aluminum in spray equipment so rinse immediately after use. **Paraquat is a restricted use herbicide.**
- SU6. Preemergence Herbicides:** Rain after application is needed for good weed control with preemergence herbicides. Herbicides which are incorporated into the soil usually require less rainfall after application for effective weed control than unincorporated herbicides. Weeds emerging through a preemergence herbicide treatment may be controlled by rotary hoeing or harrowing without reducing the effect of the herbicide unless the harrow or rotary hoe removes the herbicide from a treated band.

Soil-applied Herbicides

- SU7. Ro-Neet and Eptam** should be incorporated immediately after application regardless of whether the liquid or granular formulation is used. Nortron* and Pyramin may be used preemergence but incorporation usually improves weed control especially on fine-textured soils or with limited rainfall after application. Incorporation may reduce weed control if heavy rains follow application and incorporation may increase sugarbeet injury compared to surface application. Experience indicates that lack of rainfall is more common than excess rainfall following planting.
- SU8. Eptam (EPTC)** preplant incorporated in the spring at 2 to 3 lb ai/A or fall applied at 3.5 to 4.38 lb ai/A gives good control of annual grasses and certain broadleaf weeds. Eptam sometimes causes sugarbeet stand reduction and temporary stunting. However, no yield reduction will result if enough sugarbeet plants remain to obtain an adequate population after thinning. Eptam should be used with extreme caution on sugarbeet grown in loam or coarser-textured soils with low organic matter levels because a safe Eptam rate is difficult to predict on such soils.
- SU9. Ro-Neet (cycloate)** spring applied at 3 to 4 lb ai/A or fall applied at 4 lb ai/A gives weed control similar to Eptam. Eptam tends to give better weed control than Ro-Neet on fine-textured, high organic matter soils or under relatively dry conditions while Ro-Neet gives better control than Eptam when spring rainfall is adequate to excessive. Ro-Neet causes less sugarbeet injury than Eptam and is thus safer for use on more coarse textured, low organic matter soils. Ro-Neet should be incorporated immediately and thoroughly the same as Eptam.
- SU10. Eptam plus Ro-Neet** has less potential for sugarbeet injury than Eptam alone and is less expensive per acre than Ro-Neet alone. The rate of application of the mixture must be adjusted for soil texture and organic matter. Suggested fall applied rates are: Ro-Neet alone at 4 lb ai/A on soils with less than 3 percent organic matter, Eptam + Ro-Neet at 1 + 3 lb ai/A on loam or coarser soils with 3 percent organic matter, 1.5 + 2.5 lb ai/A on loam to clay loam soils with 3 to 4 percent organic matter, 2 + 2 lb ai/A on clay loam soils with 3.5 to

* or generic equivalent.

4.5 percent organic matter, and 2.5 + 2.5 lb ai/A on clay or clay loam soils with over 4.5 percent organic matter. Suggested spring applied rates are: Ro-Neet alone at 3 lb ai/A on loam or coarser soils with 3 percent or less organic matter, Eptam + Ro-Neet at 1 + 2.5 lb ai/A on loam or coarser soils with 3 to 3.5 percent organic matter, 1.5 + 2.5 lb ai/A on loam to clay loam soils with 3.5 to 4.5 percent organic matter, and 2 + 2 lb ai/A on clay loam or finer soils with 4 percent or more organic matter. These rates may need to be adjusted on certain fields or with certain incorporation tools based on individual experience. Eptam, Ro-Neet, or Eptam + Ro-Neet require immediate incorporation for best weed control.

- SU11. Nortron/Ethotron/Etho (ethofumesate)** at 3 to 3.75 lb ai/A gives good control of several broadleaf and grassy weeds, is especially effective on redroot pigweed, but is weak on yellow foxtail. Nortron* is the best available herbicide for control of UpBeet-resistant kochia. Nortron* generally gives less sugarbeet injury than Eptam especially on more coarse textured, low organic matter soils. Nortron* may be applied preemergence but incorporation generally improved weed control in tests in North Dakota and Minnesota. Preemergence Nortron* will give good weed control when relatively large amounts of rain follow application. The exact amount of rain needed is hard to predict but field observations indicate that at least 1 inch of rain is needed to give best results from preemergence Nortron*. Coarse textured, low organic matter soils require less rain for activation than fine textured, high organic matter soils. Nortron* often has a residue the year following use on sugarbeet. Crops most likely to be damaged by Nortron* residue are wheat, barley, and oat. Moldboard plowing usually eliminates carryover injury. Nortron* should be applied in a band to reduce cost and reduce carryover.
- SU12. Dual Magnum (s-metolachlor)** applied preemergence or preplant incorporated caused excessive sugarbeet injury in some fields in 2003. As a result, Syngenta now requires that anyone who uses fall-applied or spring-applied preemergence or preplant incorporated Dual Magnum on sugarbeet must sign a form that releases Syngenta from any liability for sugarbeet injury from Dual Magnum. Fall and Spring preemergence and preplant incorporated Dual Magnum rates range from 1.25 to 1.9 lb ai/A depending on soil texture and organic matter content. Postemergence layby Dual Magnum at 1.25 to 1.6 lb ai/A can be used without signing a release from liability. See paragraph SU24 for more on layby Dual Magnum.

Postemergence Herbicides

- SU 13. Stinger/Clopyr AG (clopyralid)** at 0.09 to 0.25 lb ai/A postemergence controls several broadleaf weeds and volunteer crops. Stinger* at 0.09 to 0.19 lb ai/A is most effective when applied to common cocklebur, giant ragweed, volunteer sunflower, wild sunflower, volunteer alfalfa, and volunteer soybean up to the six-leaf stage, common ragweed and marshelder up to the five-leaf stage, and wild buckwheat in the three to five-leaf stage before vining begins. Stinger* at 0.19 to 0.25 lb ai/A is most effective on Canada thistle in the rosette to pre-bud growth stage, but rosette application often gives better control than later application.
- SU14. Betanex/Des/Alphanex (desmedipham) and Betamix/D-P Mix/Phen-Des (desmedipham + phenmedipham)** are postemergence herbicides for the control of annual broadleaf weeds. Sugarbeet injury occasionally occurs from Betanex* and Betamix*. Sugarbeet with four true leaves is less susceptible to injury than smaller sugarbeet. Sugarbeet gains additional tolerance as plants become larger than the four-leaf stage. Betanex* at 0.08 to 0.5 lb ai/A or Betamix* at 0.08 to 0.5 lb ai/A may be applied to sugarbeet with less than four leaves. Applications totalling 0.5 lb ai/A or less should be followed by a second application in 5 to 7 days if living weeds are present after 5 days. Split application with reduced rates has reduced sugarbeet injury and increased weed control compared to a single full dose application. See Table SU1 for information on adjusting rates for sugarbeet size, sprayer pressure and presence of a soil-applied herbicide. Risk of sugarbeet injury is reduced by starting application in late afternoon so cooler temperatures follow application. Risk of injury is increased by factors such as recent flooding, high temperature, and a sudden change from a cool, cloudy environment to a hot, sunny environment. Sugarbeet and weeds in fields treated with a soil applied herbicide will be more susceptible to Betanex* and Betamix* than untreated plants. Betanex* and Betamix* vary in effectiveness on certain weed species. See Table SU5 for the weed control effectiveness of these herbicides.
- SU15. Progress/Des-Phen-Etho/BnB Plus (desmedipham + phenmedipham + ethofumesate)** applied POST gives increased control of some weed species (Table SU5) and greater risk of sugarbeet injury than desmedipham + phenmedipham (Betamix*). The active ingredients are in a 1:1:1 ratio. The rate of Progress* should be set so the total lb ai/A of the active ingredients is equal to the lb ai/A of Betamix*. For example, if the normal rate of Betamix* was 0.3 lb ai/A then Progress* also should be applied at 0.3 lb ai/A. Risk factors are the same as for Betamix*.
- SU16. Micro-rate or Mid-rate** programs use low rates of herbicides in combination applied three or more times at a 5 to 7 day interval starting when weeds are just emerging. The micro-rate treatment is Betanex* or Betamix* or Progress* plus UpBeet plus Stinger* plus methylated seed oil (MSO) adjuvant at 0.08 to 0.12 plus 0.004 plus 0.03 lb ai/A plus 1.5% v/v. The MSO is essential to increase the weed control from these low herbicide rates. The mid-rate program includes Betanex* or Betamix* or Progress* at 0.12 to 0.16 lb ai/A after sugarbeet has 4 leaves along with the same rate of Upbeet, Stinger, and MSO as in the micro-rate program. Add Assure II* at 0.028 lb ai/A or Select* at 0.03 lb ai/A or Poast at 0.06 lb ai/A to the micro-rate program to improve grass control. The micro-rate will not control ALS resistant kochia. The Stinger* rate must be increased from 0.03 to 0.06 lb ai/A for lanceleaf sage control. The micro-rate and mid-rates should be applied a minimum of three times. Three applications of the micro-rate generally has given better weed

* or generic equivalent.

control than two applications of conventional rates. Three applications of conventional rates sometimes gave better weed control than three applications of the micro-rate. Four micro-rate applications frequently have given better weed control than three applications of conventional rates or the micro-rate due to late emerging weeds. Precipitation and nozzle plugging is a common problem with ground application of the micro-rate. Several practices may reduce nozzle plugging. 1) Start with a clean sprayer, spray out the tank load immediately after mixing, spray until the tank is dry, flush sprayer between loads, clean sprayer frequently, and never allow spray solution to set in the tank. 2) Allow the spray tank water to warm before mixing and increase the pH of the water to pH 8 to 9 by using ammonia, Quad 7 or other pH increasing agents. 3) Pre-mix the UpBeet in hot water or water with pH 8 to 9. Put UpBeet in the tank first and be sure it is dissolved before adding, in order, Betanex* or Betamix* or Progress*, Stinger* and MSO type oil adjuvant. A 2% solution of household ammonia at 1 gal per 100 gal of water will give about pH 9. Add ammonia slowly as the tank fills so water pH does not go much over pH 9.0. 4) Add a grass herbicide. Tests using a single nozzle and a small volume of spray solution indicated that Assure II* reduced precipitate more than Poast or Select* but all had an effect. 5) Gentle agitation resulted in less precipitation than vigorous agitation.

- SU17. Poast (sethoxydim)** at 0.1 to 0.5 lb ai/A plus an oil adjuvant will control annual and suppress perennial grasses. An oil adjuvant must be used for consistently good grass control. Addition of ammonium sulfate at 2.5 lb ai/A or 28% nitrogen solution at 0.5 to 1 gal/A often will increase grass control from Poast; especially when the water carrier has high levels of sodium carbonate or sodium bicarbonate. Application rates for several grass species are: 0.1 lb ai/A for wild proso millet, 0.2 lb ai/A for green foxtail, yellow foxtail, giant foxtail, barnyardgrass, woolly cupgrass, wild oats or volunteer corn; 0.28 lb ai/A for volunteer cereals; and 0.28 lb ai/A plus 0.2 lb ai/A on regrowth for quackgrass. Tank mixing Poast plus oil adjuvant with Betanex*, Betamix*, or Progress* or use of the broadleaf herbicides one to three days prior to Poast may result in less grass control than from Poast plus oil.
- SU18. Select/Select Max/Arrow/Prism/Section (clethodim)** at 0.095 to 0.125 lb ai/A plus an oil adjuvant will control annual and perennial grasses. An oil adjuvant must be used for consistently good grass control. Application rates for several grass species are: 0.059 lb ai/A for volunteer corn; 0.095 lb ai/A for green foxtail, yellow foxtail, wild oats, volunteer cereals and wild-proso millet; and 0.125 lb ai/A for quackgrass. Higher rates may be needed if grasses are dense and/or large. Treatment to quackgrass should be repeated if regrowth occurs. Use of Betanex*, Betamix*, or Progress* as a tank-mix or within one day prior to Select* + oil adjuvant may reduce grass control compared to Select* + oil adjuvant without other herbicides. However, grass control from Select* was reduced less than grass control from Poast or Assure II* by tank-mixing Betanex*, Betamix*, or Progress* with the grass herbicides in field experiments.
- SU19. Assure II/Targa (quizalofop)** at 0.055 to 0.08 lb ai/A plus a petroleum oil additive will control annual and perennial grasses. Assure II* is especially effective on quackgrass although retreatment may be necessary. Assure II* is less effective on yellow foxtail than on other annual grasses. Quackgrass should be treated with 0.069 lb ai/A and regrowth should be retreated with 0.05 lb ai/A. Most annual grasses are controlled adequately by 0.055 lb ai/A. Tank mixing Assure II* plus oil adjuvant with Betanex*, Betamix*, or Progress*, or use of the broadleaf herbicides one to three days prior to Assure II* may result in less grass control than from Assure II* + oil.
- SU20. UpBeet (triflurosulfuron)** is a postemergence herbicide that should be used in combination with other broadleaf herbicides such as Betanex*, Betamix*, or Stinger*. UpBeet will antagonize grass control from Poast, Select*, or Assure II* similar to antagonism caused by Betanex*, Betamix*, or Progress*. The lowest labeled rate of UpBeet is 0.0156 lb ai/A but lower rates applied three times have provided excellent weed control. UpBeet use in a single season should not exceed 0.078 lb ai/A.
- SU21. Norton /Ethotron/Etho (ethofumesate)** at 0.094 to 0.125 lb ai/A applied post emergence in combination with Betanex*, Betamix*, or Progress* often will increase control of broadleaf weeds such as kochia, common lambsquarters and redroot pigweed. Crop rotation restrictions on the herbicide labels limit postemergence Nortron* to no more than 0.375 lb ai/A total during the growing season. So, postemergence Nortron can be applied three times at 0.125 lb ai/A or four times at 0.094 lb ai/A.
- SU22. Combinations of postemergence herbicides** give more broad spectrum and greater total weed control compared to individual treatments. The risk of sugarbeet injury also increases with combinations so combinations should be used with caution. Stinger* + Betanex* or Stinger* + Betamix* have given control of wild buckwheat, eastern black nightshade, common lambsquarters, buffalo bur, giant ragweed, ladythumb (smartweed), lanceleaf sage, and Russian thistle superior to Stinger* alone and superior to Betanex* or Betamix* alone. UpBeet plus other broadleaf herbicides has provided improved control of redroot pigweed, prostrate pigweed, kochia, common mallow, nightshade, ladythumb (smartweed) venice mallow, nightflowering catchfly, wild mustard and velvetleaf. UpBeet generally has little effect on sugarbeet injury. A three-way combination of Betanex* + Upbeet + Stinger* has given good to excellent control of all common broadleaf weeds in sugarbeet in research conducted in Minnesota and North Dakota except for kochia resistant to ALS inhibitor herbicides.

Layby Herbicides

- SU23. Trifluralin** at 0.75 lb ai/A is cleared for use on sugarbeet when the sugarbeet is 2 to 6 inches tall and well rooted. Exposed beet roots should be covered with soil before application. Emerged weeds are not

* or generic equivalent.

controlled. Trifluralin may be applied over the tops of the sugarbeet and incorporated with a harrow, rotary hoe, or cultivator adjusted to mix the herbicide in the soil without excessive sugarbeet stand reduction. Use of trifluralin can reduce the emergence of late season weeds that often cause problems in sugarbeet.

- SU24. Dual Magnum (s-metolachlor)** at 1.25 lb ai/A on medium-textured soils or 1.6 lb ai/A on fine-textured soils is registered as a layby treatment for sugarbeet. Dual Magnum should be applied after sugarbeet has 4 true leaves and can be applied more than once but the total applied must not exceed 2.5 lb ai/A. Rain or sprinkler irrigation after application is needed for activation.
- SU25. Outlook/Propel (dimethenamid-P)** at 0.84 to 0.98 lb ai/A should be applied as a layby treatment when sugarbeet has 4 to 8 true leaves. Outlook* may be applied once or sequentially but the total must not exceed 0.98 lb ai/A per season. Rain or sprinkler irrigation is needed for activation.

Table SU1. Betanex* and Betamix* rate adjustments based on sugarbeet size, sprayer pressure, and presence of a soil-applied herbicide. Progress* should be used at the same lb ai/A; to convert to the Progress* rate in pt/A, multiply the pt/A rate below by 0.75.

Sugarbeet stage	Desmedipham (Betanex*) or Desmedipham + Phenmedipham (Betamix*) Broadcast Rate							
	No Soil Herbicide				With Soil Herbicide			
	Low Pressure (<100 psi)		High Pressure or aerial		Low Pressure (<100 psi)		High Pressure or aerial	
	(lb/ ai/A)	(pt/A)	(lb ai/A)	(pt/A)	(lb ai/A)	(pt/A)	(lb/ aiA)	(pt/A)
Cotyledon–2 leaf	0.25	1.5	0.16	1.0	0.16	1.0	0.12	0.75
2 leaf	0.33	2.0	0.25	1.5	0.25	1.5	0.16	1.0
4 leaf	0.50	3.0	0.40	2.5	0.33	2.0	0.25	1.5
6-8 leaf	0.75	4.6	0.75	4.6	0.50	3.0	0.50	3.0

* or generic equivalent.

Table SU2. Package mixtures labeled for use in Sugarbeet are as follows:

Trade Name	Formulation	Common Name	Active Ingredient
Betamix	1.3 E	desmedipham & phenmedipham	0.65 lb/gal & 0.65 lb/gal
BnB Plus	1.8 E	desmedipham & phenmedipham & ethofumesate	0.6 lb/gal & 0.6 lb/gal & 0.6 lb/gal
Des-Phen-Etho	1.8 E	desmedipham & phenmedipham & ethofumesate	0.6 lb/gal & 0.6 lb/gal & 0.6 lb/gal
DP-Mix	1.3 E	desmedipham & phenmedipham	0.65 lb/gal & 0.65 lb/gal
Phen-Des 8+8	1.3 E	phenmedipham & desmedipham	0.65 lb/gal & 0.65 lb/gal
Progress	1.8 E	phenmedipham & desmedipham & ethofumesate	0.6 lb/gal & 0.6 lb/gal & 0.6 lb/gal

Table SU3. Crop Stage and Harvest Restrictions for Sugarbeet

Herbicide Name	Minimum Crop Stage	Maximum Crop Stage	Harvest Restriction (days)
Alphanex (desmedipham)	cotyledon	none	75
Arrow (clethodim)	none	none	40
Assure II (quizalofop)	none	none	45
Betamix (desmedipham & phenmedipham)	cotyledon	none	75
Betanex (desmedipham)	cotyledon	none	75
BnB Plus (desmedipham & phenmedipham & ethofumesate)	cotyledon	none	75
Clopyr AG (clopyralid)	cotyledon	8 leaf	45
Des (desmedipham)	cotyledon	none	75
Des-Phen-Etho (desmedipham & phenmedipham & ethofumesate)	cotyledon	none	75
DP-Mix (desmedipham & phenmedipham)	cotyledon	none	75
Dual Magnum (s-metolachlor)	4 leaf (layby application)	none (layby application)	60
Eptam (EPTC)	n.a.	n.a.	none
Etho SC (ethofumesate)	n.a.	n.a.	90
Ethotron SC (ethofumesate)	n.a.	n.a.	90
Nortron SC (ethofumesate)	n.a.	n.a.	90
Outlook (dimethenamid-P)	4 leaf (layby application)	8 leaf (layby application)	60
Phen-Des 8+8 (desmedipham & phenmedipham)	cotyledon	none	75
Poast (sethoxydim)	none	none	60
Prism (clethodim)	none	none	40
Progress (desmedipham & phenmedipham & ethofumesate)	cotyledon	none	75
Propel (dimethenamid-P)	4 leaf (layby application)	8 leaf (layby application)	60
Ro-Neet (cycloate)	n.a.	n.a.	none
Section (clethodim)	none	none	40
Select (clethodim)	none	none	40
Select Max (clethodim)	none	none	40
Stinger (clopyralid)	cotyledon	8 leaf	45
Targa (quizalofop)	none	none	45
Treflan (trifluralin)	2 inches (layby application)	6 inches (layby application)	none
trifluralin, others (trifluralin)	2 inches (layby application)	6 inches (layby application)	none
Trust (trifluralin)	2 inches (layby application)	6 inches (layby application)	none
UpBeet (triflusulfuron)	none	none	60

Table SU4. Summary of herbicides for use in Sugarbeet

Application Type				
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks	
Fall				
Eptam 7 E (EPTC)	4 to 5 pts (3.5 to 4.38 lb ai/A)	F/G	Annual grasses and some broadleaf weeds. Some stand reduction and temporary stunting may occur from the use of EPTC. Weak on wild mustard. Fall incorporated after October 15 until freeze-up. Can be tank mixed with Ro-Neet (cycloate) for better sugarbeet tolerance. See narrative for suggested rates for various soil types.	
Ro-Neet 6 E (cycloate)	5.3 pts (4 lb ai/A)	G	Fall incorporated after October 15 until freeze-up. Sugarbeet has better tolerance to cycloate than to EPTC. Weak on wild mustard. Weed control poor on fine-textured, high organic matter soils.	
Burndown				
Glyphomax XRT 4 S	6 to 24 oz	-	Emerged grasses and broadleaf weeds. Preplant or any time prior to crop emergence. A nonselective, translocated postemergence herbicide. No soil residual. Apply with nonionic surfactant at 0.5% v/v.	
Roundup Original MAX 4.5 S	5.4 to 21 oz			
Roundup WeatherMAX 4.5 S	5.4 to 21 fl oz			
Touchdown Hi-Tech 5 L	5 to 19 oz			
Touchdown Total 4.17 L (glyphosate)	5 to 20 oz (0.19 to 0.75 lb ai/A)			
Gramoxone Inteon 2 S	2 to 4 pts	-	Emerged annual grasses and broadleaf weeds. Preplant or any time prior to crop emergence. No soil residual. A nonselective postemergence herbicide. Apply with nonionic surfactant at 0.25% v/v. Restricted Use Herbicide.	
Gramoxone Max 3 S (paraquat)	1.3 to 2.7 pts (0.5 to 1.0 lb ai/A)			
Preplant Incorporated				
Eptam 7 E (EPTC)	2.3 to 3.4 pts (2 to 3 lb ai/A)	F/G	Annual grasses and some broadleaf weeds. Preplant incorporated. Some stand reduction and temporary stunting may occur from the use of EPTC. Weak on wild mustard. Can be tank mixed with Ro-Neet (cycloate) for better sugarbeet tolerance. See narrative for suggested rates for various soil types.	
Etho SC 4 SC (ethofumesate)	6 to 7.5 pts (3 to 3.75 lb ai/A)	G	Annual grasses and broadleaf weeds. Especially good on redroot pigweed. Provides fair to good kochia control. Preemergence or preplant incorporated. Incorporation generally improves weed control. Band application reduces cost and risk of carryover into the next year compared to a broadcast application.	
Ethotron SC 4 SC (ethofumesate)	6 to 7.5 pts (3 to 3.75 lb ai/A)	G	Annual grasses and broadleaf weeds. Especially good on redroot pigweed. Provides fair to good kochia control. Preemergence or preplant incorporated. Incorporation generally improves weed control. Band application reduces cost and risk of carryover into the next year compared to a broadcast application.	
Nortron SC 4 SC (ethofumesate)	6 to 7.5 pts (3 to 3.75 lb ai/A)	G	Annual grasses and broadleaf weeds. Especially good on redroot pigweed. Provides fair to good kochia control. Preemergence or preplant incorporated. Incorporation generally improves weed control. Band application reduces cost and risk of carryover into the next year compared to a broadcast application.	
Ro-Neet 6 E (cycloate)	4 to 5.3 pts (3 to 4 lb ai/A)	G	Spring preplant incorporated. Sugarbeet has better tolerance to cycloate than to EPTC. Weak on wild mustard. Weed control poor on fine-textured, high organic matter soils.	
Preemergence				
Dual Magnum 7.62 E (s-metolachlor)	1.33 to 2 pts (1.25 to 1.9 lb ai/A)	P/F	Has caused significant sugarbeet injury. User must sign a release from liability. Controls pigweed species and annual grasses.	

Table SU4. Summary of herbicides for use in Sugarbeet

<u>Application Type</u>		Crop	
Herbicide / Formulation	Rate Range	Tolerance	Remarks
Preemergence			
Etho SC 4 SC (ethofumesate)	6 to 7.5 pts (3 to 3.75 lb ai/A)	G	Annual grasses and broadleaf weeds. Especially good on redroot pigweed. Provides fair to good kochia control. Preemergence or preplant incorporated. Incorporation generally improves weed control. Band application reduces cost and risk of carryover into the next year compared to a broadcast application.
Ethotron SC 4 SC (ethofumesate)	6 to 7.5 pts (3 to 3.75 lb ai/A)	G	Annual grasses and broadleaf weeds. Especially good on redroot pigweed. Provides fair to good kochia control. Preemergence or preplant incorporated. Incorporation generally improves weed control. Band application reduces cost and risk of carryover into the next year compared to a broadcast application.
Nortron SC 4 SC (ethofumesate)	6 to 7.5 pts (3 to 3.75 lb ai/A)	G	Annual grasses and broadleaf weeds. Especially good on redroot pigweed. Provides fair to good kochia control. Preemergence or preplant incorporated. Incorporation generally improves weed control. Band application reduces cost and risk of carryover into the next year compared to a broadcast application.
Postemergence			
Alphanex 1.3 E (desmedipham)	0.75 to 7.5 pts (0.12 to 1.2 lb ai/A)	F/G	Most annual broadleaf weeds. Postemergence when broadleaf weeds are from cotyledon to 4-leaf stage. Sugarbeet with less than 4 leaves will tolerate 0.12 to 0.5 lb ai/A and sugarbeet with 4 leaves or more will tolerate higher rates. Risk of sugarbeet injury is reduced by starting application in late afternoon and risk is increased by certain environments. Split application with reduced rates has reduced sugarbeet injury and increased weed control compared to single full dose application. May be applied with Upbeet (triflurosulfuron) + Clopyr AG or Stinger (clopyralid) + adjuvant in the Micro Rate Program. Refer to the narrative.
Arrow 2 EC (clethodim)	6 to 16 fl oz (0.094 to 0.25 lb ai/A)	G	See narrative for rates for specific grass species. Always apply with an oil adjuvant.
Assure II 0.88 E (quizalofop)	8 to 12 fl oz (0.055 to 0.08 lb ai/A)	G	Less effective on yellow foxtail than on other grasses. Especially effective on quackgrass. See narrative for rates for specific grass weeds.
Betamix 1.3 E (desmedipham & phenmedipham)	0.75 to 7.5 pts (0.06 to 0.6 + 0.06 to 0.6 lb ai/A)	F/G	Most annual broadleaf weeds. Postemergence when broadleaf weeds are from cotyledon to 4-leaf stage. Sugarbeet with less than 4 leaves will tolerate 0.12 to 0.5 lb ai/A and sugarbeet with 4 leaves or more will tolerate higher rates. Risk of sugarbeet injury is reduced by starting application in late afternoon and risk is increased by certain environments. Split application with reduced rates has reduced sugarbeet injury and increased weed control compared to single full dose application. May be applied with Upbeet (triflurosulfuron) + Clopyr AG or Stinger (clopyralid) + adjuvant in the Micro Rate Program. Refer to the narrative.
Betanex 1.3 E (desmedipham)	0.75 to 7.5 pts (0.12 to 1.2 lb ai/A)	F/G	Most annual broadleaf weeds. Postemergence when broadleaf weeds are from cotyledon to 4-leaf stage. Sugarbeet with less than 4 leaves will tolerate 0.12 to 0.5 lb ai/A and sugarbeet with 4 leaves or more will tolerate higher rates. Risk of sugarbeet injury is reduced by starting application in late afternoon and risk is increased by certain environments. Split application with reduced rates has reduced sugarbeet injury and increased weed control compared to single full dose application. May be applied with Upbeet (triflurosulfuron) + Clopyr AG or Stinger (clopyralid) + adjuvant in the Micro Rate Program. Refer to the narrative.
BnB Plus 1.8 E (desmedipham & phenmedipham & ethofumesate)	0.8 to 3.3 pts (0.06 to 0.25 + 0.06 to 0.25 + 0.06 to 0.25 lb ai/A)	F/G	Increased weed control and greater risk of sugarbeet injury than from desmedipham + phenmedipham. Three herbicides should be used in a 1:1:1 ratio of active ingredients. The total rate of desmedipham + phenmedipham + ethofumesate in lb/A should equal the normal rate of desmedipham + phenmedipham for a given situation. May be applied with Upbeet (triflurosulfuron) + Clopyr AG or Stinger (clopyralid) + adjuvant in the Micro Rate Program. Refer to the narrative.
Clopyr AG 3 S (clopyralid)	0.25 to 0.66 pt (0.09 to 0.25 lb ai/A)	G	Apply postemergence to sugarbeet with 2 to 8 leaves. Good control of Canada thistle and certain broadleaf weeds. See narrative for rates and treatment sizes for various species. Stinger may be tank mixed with desmedipham or desmedipham + phenmedipham. See narrative for crop rotation restrictions.

Table SU4. Summary of herbicides for use in Sugarbeet

Application Type		Crop	
Herbicide / Formulation	Rate Range	Tolerance	Remarks
Postemergence			
Des 1.3 E (desmedipham)	0.75 to 7.5 pts (0.12 to 1.2 lb ai/A)	F/G	Most annual broadleaf weeds. Postemergence when broadleaf weeds are from cotyledon to 4-leaf stage. Sugarbeet with less than 4 leaves will tolerate 0.12 to 0.5 lb ai/A and sugarbeet with 4 leaves or more will tolerate higher rates. Risk of sugarbeet injury is reduced by starting application in late afternoon and risk is increased by certain environments. Split application with reduced rates has reduced sugarbeet injury and increased weed control compared to single full dose application. May be applied with Upbeet (triflurosulfuron) + Clopyr AG or Stinger (clopyralid) + adjuvant in the Micro Rate Program. Refer to the narrative.
Des-Phen-Etho 1.8 E (desmedipham & phenmedipham & ethofumesate)	0.8 to 3.3 pts (0.06 to 0.25 + 0.06 to 0.25 + 0.06 to 0.25 lb ai/A)	F/G	Increased weed control and greater risk of sugarbeet injury than from desmedipham + phenmedipham. Three herbicides should be used in a 1:1:1 ratio of active ingredients. The total rate of desmedipham + phenmedipham + ethofumesate in lb/A should equal the normal rate of desmedipham + phenmedipham for a given situation. May be applied with Upbeet (triflurosulfuron) + Clopyr AG or Stinger (clopyralid) + adjuvant in the Micro Rate Program. Refer to the narrative.
DP-Mix 1.3 E (desmedipham & phenmedipham)	0.75 to 7.5 pts (0.06 to 0.6 + 0.06 to 0.6 lb ai/A)	F/G	Most annual broadleaf weeds. Postemergence when broadleaf weeds are from cotyledon to 4-leaf stage. Sugarbeet with less than 4 leaves will tolerate 0.12 to 0.5 lb ai/A and sugarbeet with 4 leaves or more will tolerate higher rates. Risk of sugarbeet injury is reduced by starting application in late afternoon and risk is increased by certain environments. Split application with reduced rates has reduced sugarbeet injury and increased weed control compared to single full dose application. May be applied with Upbeet (triflurosulfuron) + Clopyr AG or Stinger (clopyralid) + adjuvant in the Micro Rate Program. Refer to the narrative.
Phen-Des 8+8 1.3 E (desmedipham & phenmedipham)	0.75 to 7.5 pts (0.06 to 0.6 + 0.06 to 0.6 lb ai/A)	F/G	Most annual broadleaf weeds. Postemergence when broadleaf weeds are from cotyledon to 4-leaf stage. Sugarbeet with less than 4 leaves will tolerate 0.12 to 0.5 lb ai/A and sugarbeet with 4 leaves or more will tolerate higher rates. Risk of sugarbeet injury is reduced by starting application in late afternoon and risk is increased by certain environments. Split application with reduced rates has reduced sugarbeet injury and increased weed control compared to single full dose application. May be applied with Upbeet (triflurosulfuron) + Clopyr AG or Stinger (clopyralid) + adjuvant in the Micro Rate Program. Refer to the narrative.
Poast 1.5 E (sethoxydim)	0.5 to 2.5 pts (0.1 to 0.5 lb ai/A)	G	Apply to actively growing grasses. See narrative for rates for specific grass weeds. Always apply with oil additive.
Prism 0.94 E (clethodim)	0.8 to 2.1 pts (0.095 to 0.25 lb ai/A)	G	See narrative for rates for specific grass species. Always apply with an oil adjuvant.
Progress 1.8 E (desmedipham & phenmedipham & ethofumesate)	0.8 to 3.3 pts (0.06 to 0.25 + 0.06 to 0.25 + 0.06 to 0.25 lb ai/A)	F/G	Increased weed control and greater risk of sugarbeet injury than from desmedipham + phenmedipham. Three herbicides should be used in a 1:1:1 ratio of active ingredients. The total rate of desmedipham + phenmedipham + ethofumesate in lb/A should equal the normal rate of desmedipham + phenmedipham for a given situation. May be applied with Upbeet (triflurosulfuron) + Clopyr AG or Stinger (clopyralid) + adjuvant in the Micro Rate Program. Refer to the narrative.
Section 2 EC (clethodim)	6 to 16 fl oz (0.095 to 0.25 lb ai/A)	G	See narrative for rates for specific grass species. Always apply with an oil adjuvant.
Select 2 EC (clethodim)	6 to 16 fl oz (0.095 to 0.25 lb ai/A)	G	See narrative for rates for specific grass species. Always apply with an oil adjuvant.
Select Max 0.97 EC (clethodim)	3 to 12 fl oz (0.023 to 0.09 lb ai/A)	G	Use 3 fl oz/A with the micro-rate and mid-rate program. No adjuvant is needed for the 9 to 12 fl oz/A rates.
Stinger 3 S (clopyralid)	0.25 to 0.66 pt (0.09 to 0.25 lb ai/A)	G	Apply postemergence to sugarbeet with 2 to 8 leaves. Good control of Canada thistle and certain broadleaf weeds. See narrative for rates and treatment sizes for various species. Stinger may be tank mixed with desmedipham or desmedipham + phenmedipham. See narrative for crop rotation restrictions.

Table SU4. Summary of herbicides for use in Sugarbeet

Application Type			
Herbicide / Formulation	Rate Range	Crop Tolerance	Remarks
Postemergence			
Targa 0.88 E (quizalofop)	8 to 12 fl oz (0.055 to 0.08 lb ai/A)	G	Less effective on yellow foxtail than on other grasses. Especially effective on quackgrass. See narrative for rates for specific grass weeds.
UpBeet 50 DF (triflusulfuron)	0.5 oz (0.0156 lb ai/A)	G	Apply two or more times in combination with other broadleaf herbicides. Research in Minnesota and North Dakota has shown that three treatments including 0.25 to 0.33 oz product/A of Upbeet generally gave better weed control than two treatments including 0.5 oz/A of triflusulfuron.
Layby			
Dual Magnum 7.62 E (s-metolachlor)	0.33 to 1.67 pts (1.25 to 1.6 lb ai/A)	F/G	Grass and some broadleaf weeds. Layby treatment when sugarbeet 4-leaf or larger. Does not control weeds that have emerged at application.
Outlook 6 E (dimethenamid-P)	18 to 21 fl oz (0.84 to 0.98 lb ai/A)	F/G	Grass and some broadleaf weeds. Layby treatment when sugarbeet 4- to 8- leaf. Does not control weeds that have emerged at application.
Propel 6 E (dimethenamid-P)	18 to 21 fl oz (0.84 to 0.98 lb ai/A)	F/G	Grass and some broadleaf weeds. Layby treatment when sugarbeet 4- to 8- leaf. Does not control weeds that have emerged at application.
trifluralin 4 E (trifluralin)	1.5 pts (0.75 lb ai/A)	F	Grass and some broadleaf weeds. Sugarbeet 2 to 6 inches tall and well rooted to withstand incorporation. Must be incorporated. Exposed beet roots must be covered with soil before application. May be applied over the tops of sugarbeet.

Table SU5. Effectiveness of herbicides on major weeds in Sugarbeet

Herbicides	Grasses				Broadleaves													Perennials		
	Barryardgrass	Giant and robust Foxtail	Green Foxtail	Yellow Foxtail	Wild Oats	Common Cocklebur	Common Lambquarters	Common Ragweed	Eastern Black Nightshade	Kochia*	Ladysthumb (smartweed)	Common Mallow	Redroot Pigweed	Prostrate pigweed	Russian Thistle	Wild Sunflower	Wild Buckwheat	Wild Mustard	Canada Thistle	
Fall																				
Eptam (EPTC)	G	G	G	G	F/G	G	P	F	F	F/G	F	P	F/G	F/G	F/G	P	N	F	P	N
Ro-Neet (cycloate)	G	G	G	G	F/G	G	P	F/G	F	F/G	P	P	F/G	F/G	F/G	P	N	P/F	P	N
Preplant Incorporated																				
Eptam (EPTC)	G	G	G	G	F/G	G	P	F	F	F/G	F	P	F/G	F/G	F/G	P	N	F	P	N
Etho SC (ethofumesate)	P	F/G	F/G	F/G	F/G	F	P	P/F	P	F/G	F/G	G	P	G	F/G	F/G	P	F/G	F	N
Ethotron SC (ethofumesate)	P	F/G	F/G	F/G	F/G	F	P	P/F	P	F/G	F/G	G	P	G	F/G	F/G	P	F/G	F	N
Nortron SC (ethofumesate)	P	F/G	F/G	F/G	F/G	F	P	P/F	P	F/G	F/G	G	P	G	F/G	F/G	P	F/G	F	N
Ro-Neet (cycloate)	G	G	G	G	F/G	G	P	F/G	F	F/G	P	P	F/G	F/G	F/G	P	N	P/F	P	N
Preemergence																				
Dual Magnum (s-metolachlor)	G	G	G	G	P	P	N	F/P	P	F	P	P	G	G	F	N	P	P	N	N
Etho SC (ethofumesate)	P	F/G	F/G	F/G	F/G	F	P	P/F	P	F/G	F/G	G	P	G	F/G	F/G	P	F/G	F	N
Ethotron SC (ethofumesate)	P	F/G	F/G	F/G	F/G	F	P	P/F	P	F/G	F/G	G	P	G	F/G	F/G	P	F/G	F	N
Nortron SC (ethofumesate)	P	F/G	F/G	F/G	F/G	F	P	P/F	P	F/G	F/G	G	P	G	F/G	F/G	P	F/G	F	N
Postemergence																				
Alphanex (desmedipham)	P	P	P	P	N	F/G	P/F	G	F	F/G	P/F	P	P	G	G	P	P	P/F	G	N
Arrow (clethodim)	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Assure II (quizalofop)	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Betamix (desmedipham & phenmedipham)	P	F	F	F	N	F/G	F	G	F	F/G	F	P	P	F/G	F/G	P	P	F	G	N
Betanex (desmedipham)	P	P	P	P	N	F/G	P/F	G	F	F/G	P/F	P	P	G	G	P	P	P/F	G	N
BnB Plus (desmedipham & phenmedipham & ethofumesate)	P	F/G	F/G	F/G	N	G	F	G	F	G	F/G	F/G	P	F/G	F/G	P	P	F/G	G	N
Clopyr AG (clopyralid)	P	N	N	N	N	F/G	G	P/F	G	F/G	N	P/F	P	P	P	P/F	G	F/G	P	G
Des (desmedipham)	P	P	P	P	N	F/G	P/F	G	F	F/G	P/F	P	P	G	G	P	P	P/F	G	N
Des-Phen-Etho (desmedipham & phenmedipham & ethofumesate)	P	F/G	F/G	F/G	N	G	F	G	F	G	F/G	F/G	P	F/G	F/G	P	P	F/G	G	N
DP-Mix (desmedipham & phenmedipham)	P	F	F	F	N	F/G	F	G	F	F/G	F	P	P	F/G	F/G	P	P	F	G	N
Phen-Des 8+8 (desmedipham & phenmedipham)	P	F	F	F	N	F/G	F	G	F	F/G	F	P	P	F/G	F/G	P	P	F	G	N
Poast (sethoxydim)	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Prism (clethodim)	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Progress (desmedipham & phenmedipham & ethofumesate)	P	F/G	F/G	F/G	N	G	F	G	F	G	F/G	F/G	P	F/G	F/G	P	P	F/G	G	N
Section (clethodim)	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Select (clethodim)	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Stinger (clopyralid)	P	N	N	N	N	F/G	G	P/F	G	F/G	N	P/F	P	P	P	P/F	G	F/G	P	G
Targa (quizalofop)	G	G	G	G	G	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
UpBeet (triflusaluron)	P	F/G	F/G	F/G	N	F/G	F	P	P	F	P/G	F	G	G	G	P	F/G	P	G	N
Layby																				
Dual Magnum (s-metolachlor)	G	G	G	G	P	P	N	F/P	P	F	P	P	G	G	F	N	P	P	N	N
Outlook (dimethenamid-P)	G	G	G	G	P	P	N	F/P	P	F	P	P	G	G	F	N	P	P	N	N
Propel (dimethenamid-P)	G	G	G	G	P	P	N	F/P	P	F	P	P	G	G	F	N	P	P	N	N

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.

* Control with UpBeet depends on Kochia resistance.

Table SU5. Effectiveness of herbicides on major weeds in Sugarbeet

Herbicides	Grasses					Broadleaves										Perennials				
	Barnyardgrass	Giant and robust Foxtail	Green Foxtail	Yellow Foxtail	Wild Oats	Buffalobur	Common Cocklebur	Common Lambsquarters	Common Ragweed	Eastern Black Nightshade	Kochia*	Ladysthumb (smartweed)	Common Mallow	Redroot Pigweed	Prostrate pigweed	Russian Thistle	Wild Sunflower	Wild Buckwheat	Wild Mustard	Canada Thistle
trifluralin, others (trifluralin)	G	G	G	G	F	P	N	G	P	N	G	P	P	G	G	N	N	F	N	N

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.

* Control with UpBeet depends on Kochia resistance.