Chapter 7 – Weed Control in Sugarbeets

This chapter is intended to provide herbicide information for weed control in sugarbeets. To effectively manage weeds, a combination of cultural, chemical, and sometimes even mechanical weed control practices is implemented. Below is a listing of recommendations and considerations that should be followed for effective weed management in sugarbeets.

1. Herbicide-resistant weeds.

Group 9 (glyphosate) resistant weeds, especially horseweed and waterhemp, are the biggest weed control challenge in sugarbeet production. Resistance to glyphosate and additional resistance issues in these and other weeds makes it important to be aware of the specific herbicide site of action (SOA) group(s) that a weed is resistant to in order to select the most effective herbicide for control.

2. Weed control before or at planting.

Effective weed control in sugarbeets requires that all weeds be controlled prior to sugarbeet emergence. This is generally accomplished with tillage or stale-seed bed preparation prior to sugarbeet planting. However, if weed growth is excessive growers may want to control existing vegetation with a burndown application prior to tillage or planting. Currently, glyphosate, Gramoxone, Liberty Ultra, and Sequence (**Table 7B**) are the only herbicides registered for this use prior to planting sugarbeets.

3. Soil-applied herbicides.

The use of soil-applied residual herbicides prior to sugarbeet planting is fairly uncommon. However, with the increased spread of Group 9 resistant waterhemp Dual Magnum (at reduced rate) or Nortron/Ethotron use prior to planting can help provide early season waterhemp control, prior to overlapping residual postemergence herbicide applications. Information on the effectiveness of soil-applied herbicides can be found in **Table 7A**. **Table 7B** provides important information on each soil-applied herbicide.

4. Postemergence herbicides.

Season-long weed control in sugarbeet requires 2- to 4-postemergence herbicide applications. Glyphosate is the foundation herbicide for these applications, since the majority of sugarbeets grown in Michigan are Roundup Ready. However, additional postemergence herbicides, including herbicides with residual control, are often tank-mixed with glyphosate to control Group 9 resistant weeds and volunteer corn and canola. **Table 7A** provides the effectiveness of postemergence herbicides, and **Table 7B** contains important information on timings, rates, and additives for each postemergence herbicide.

5. Rotation restrictions.

Prior to herbicide use it is always important to determine if the herbicide application that you make this year may affect your crop rotation plan for the following years. **Table 12** provides a complete listing of crop rotation restrictions for all sugarbeet herbicides.

Abbreviations for this chapter:

Herbicide Formulations: Table 14
Herbicide Sites of Action: Pages 14-15

Application Timings:

PPI = preplant incorporated
PRE = preemergence
POST = postemergence

Units of Measure:

fl oz = fluid ounces
lb = pounds
oz = ounces
pt = pints
% v/v = % volume/volume

Additives:

AMS = ammonium sulfate
COC = crop oil concentrate
MSO = methylated seed oil
NIS = non-ionic surfactant

Sugarbeet Traits:

N = no specific trait required
RR = Roundup Ready

TABLE 7A — Weed Response to Herbicides in Sugarbeet*

Preplant Incorporated	Site of Action	Sugarbeet Tolerance**	Annual Broadleaves												Annual Grasses							Perennials				
			Cocklebur	Horseweed (marestail)[a]	Jimsonweed	Lambsquarters	Nightshade (E. black)	Pigweed	Ragweed (Common)	Smartweed	Velvetleaf	Waterhemp[b]	Wild mustard	Wild buckwheat	Barnyardgrass	Crabgrass	Giant foxtail	Green foxtail	Yellow foxtail	Fall panicum	Witchgrass	Bindweed (Field & Hedge)	Canada thistle	Perennial sowthistle	Quackgrass	Yellow nutsedge
Ro-Neet	8	2	P	–	P	F	F	**G**	F	P	**G**	**G**	P	F	**G**	**G**	**G**	**G**	**G**	**G**	**G**	N	N	N	F	**G**
Preemergence																										
Dual Magnum (0.5 pt)	15	2	N	P	N	P	F	**G**	N	N	N	**G**	N	N	**G**	**G**	**G**	**G**	**G**	F	F	N	N	N	N	P
Nortron/Ethotron	15	2	F	–	F	**G**	**G**	**G**	P	**G**	F	**G**	**G**	**G**	P	F	**G**	F	F	P	P	N	N	N	N	P
Postemergence																										
Assure II	1	1	N	N	N	N	N	N	N	N	N	N	N	N	**G**	**G**	**E**	**E**	F	**E**	**E**	N	N	N	**E**	N
Fusilade DX	1	1	N	N	N	N	N	N	N	N	N	N	N	N	**E**	**G**	**E**	**E**	**E**	**E**	**E**	N	N	N	**G**	N
Nortron/Ethotron	15	2	P	–	P	F	**G**	F	P	**G**	P	F	**G**	**G**	P	P	F	F	F	P	P	N	N	N	N	P
Select Max	1	1	N	N	N	N	N	N	N	N	N	N	N	N	**E**	**G**	**E**	**E**	**E**	**E**	**E**	N	N	N	**G**	N
Stinger	4	1	**E**	**G**	**G**	P	F	P	**E**	F	P	P	P	F	N	N	N	N	N	N	N	P	**G**	**G**	N	N
Upbeet	2	2	F	N	P	P	F	F	F	F	**G**	N	**E**	F	P	P	F	F	F	P	P	N	P	P	N	N
Postemergence Layby[c]																										
Dual Magnum, others	15	2	N	P	N	P	F	**G**	P	P	N	**G**	P	N	**E**	**E**	**E**	**E**	**E**	**G**	**G**	N	N	N	N	P
Outlook	15	2	N	P	N	P	**G**	**G**	P	P	N	**G**	P	P	**E**	**E**	**E**	**E**	**E**	**G**	**G**	N	N	N	N	P
Warrant/Enversa	15	2	P	P	N	F	**G**	**G**	F	P	P	**G**	P	P	**E**	**E**	**E**	**E**	**E**	**E**	**E**	N	N	N	N	P
Glyphosate-Resistant (Roundup Ready) Sugarbeets																										
Glyphosate	9	1	**E**	N	**E**	**G**	**G**	**E**	**G**	**G**	**G**	N	**G**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**G**	**G**	**G**	**E**	F
Sequence	9/15	2	**E**	N	**E**	**G**	**G**	**E**	**G**	**G**	**G**	N[d]	**G**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**G**	**G**	**G**	**E**	F

Herbicide Site of Action: The site of action key is located on pages 14-15.

Herbicide Effectiveness: P = Poor; F = Fair; **G** = Good; **E** = Excellent; N = None; – = Not enough information to rank

* The above ratings are a relative comparison of herbicide effectiveness. Weather conditions greatly influence the herbicide's effectiveness, and weed control may be better under favorable conditions or poorer under unfavorable conditions.

** Crop Tolerance: 1=Minimal risk of crop injury; 2=Crop injury can occur under certain conditions (soil applied—cold, wet: foliar applied—hot, humid); 3=Severe crop injury can occur. Follow precautions under Remarks and Limitations and on the label; 4=Risk of severe crop injury is high.

[a] Most horseweed populations in Michigan are resistant to ALS-inhibiting herbicides (Group 2). Herbicides that have this site of action group will not provide control and therefore are rated as no control. The best way to manage horseweed in dry beans is with tillage prior to planting.

[b] Most waterhemp populations in Michigan are resistant to ALS-inhibiting herbicides (Group 2). Herbicides that have these site of action groups will not provide control and therefore are rated as no control.

[c] Postemergence Dual Magnum, Outlook and Warrant will not control emerged weeds, but will provide resiudal control of the weeds listed above.

[d] Sequence will not provide control of emerged waterhemp, but will provide good residual control.

TABLE 7B — Sugarbeet Herbicides — Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
Assure II 0.88EC (others)	quizalofop	1	POST	7 fl oz + COC 1% v/v	N

- Assure II provides postemergence grass and volunteer corn control. Refer to Table 7A for weed control and crop tolerance ratings.
- Assure II rates range from 5 to 12 fl oz/A and are based on weed size and sensitivity. Refer to Table 2E for maximum weed sizes.
- Apply Assure II with COC (1% v/v) for best results. NIS (0.25% v/v) may replace COC for certain tank-mixtures (see label).
- Apply 5 fl oz/A of Assure II for volunteer corn control up to 18 inches tall; and 8 fl oz/A for corn up to 30 inches tall. Assure II will not control volunteer Enlist corn.
- Apply a minimum of 8 fl oz/A of Assure II for barnyardgrass and large crabgrass control.
- For perennial grass control, higher rates (10-12 fl oz/A) and sequential applications may be needed.
- Apply a minimum of 8 fl oz/A to control spring-seeded cereals and 10 fl oz/A to control fall-seeded cereals.
- Assure II can be applied with other herbicides labled for use in sugarbeet including glyphosate.
- DO NOT make more than 4 applications of Assure II or apply more than 25 fl oz/A/year.
- Preharvest interval (PHI): 45 days
- Refer to Table 12 and the label for crop rotation restrictions.

Dual Magnum 7.62EC (only)	s-metolachlor	15	PRE	0.5 pt	N
Dual Magnum, EverpreX 7.62EC Dual II Magnum 7.64EC	s-metolachlor	15	POST	1.33 pt	N

- Refer to Table 7A for weed control and crop tolerance ratings.
- Dual Magnum has a special local needs 24(c) registration for preemergence applications of a reduced rate of 0.5 pt/A to provide some initial control of glyphosate-resistant waterhemp and Palmer amaranth (pigweed species).
- Additional application(s) of Dual Magnum, Outlook or Warrant will be needed postemergence to provide overlapping residual control of pigweed species.
- Higher rates of Dual Magnum applied preemergence have resulted in reduced sugarbeet stands under cold-wet conditions.
- By using this product preemergence you assume all potential risk of crop injury.

Postemergence: Apply after sugarbeets have 2-fully expanded true leaves; applications prior to this stage will result in significant crop injury and possible stand reduction.

- Crop safety is higher when applications are made after beets reach the 4-leaf stage.
- Application rates are based on soil texture – apply 1 pt/A on course; 1.33 pt/A on medium; and 1.67 pt/A on fine textured soils.
- Postemergence applications will not control emerged weeds, but will provide residual control of annual grasses and some broadleaf weeds, including waterhemp and Palmer amaranth.
- Apply with with other herbicides labled for use in sugarbeet including glyphosate for residual weed control in glyphosate-resistant sugarbeets.
- More than one postemergence application can be made, but the total should not exceed 2.67 pt/A/year.
- Preharvest interval (PHI): 60 days
- Refer to Table 12 and the label for crop rotation restrictions.

Fusilade DX 2EC	fluazifop	1	POST	12 fl oz + COC 1% v/v	N

- Fusilade DX provides postemergence grass and volunteer corn control. Refer to Table 7A for weed control and crop tolerance ratings.
- Fusilade DX rates range from 6 to 12 fl oz/A and are based on weed size and sensitivity. Refer to Table 2E for maximum weed sizes.
- Apply Fusilade with COC (1% v/v) for best results. NIS (0.25% v/v) may replace COC for certain tank-mixtures (see label).
- Apply 6 fl oz/A of Fusilade DX for volunteer corn control from 12 to 24 inches tall. The rate can be reduced to 4 fl oz/A if volunteer corn is less than 12 inches tall and Fusilade DX is tank-mixed with glyphosate + AMS (17 lb/100 gal). Fusilade DX will not control volunteer Enlist corn.
- For perennial grass control, sequential applications (10-21 days apart) are needed 12 followed by 8 fl oz/A or 16 followed by 14 fl oz/A for heavy grass pressure.
- Apply a minimum of 8 fl oz/A to control spring seeded cereals up to 6 inches tall.
- Fusilade DX can be applied with other herbicides labled for use in sugarbeet including glyphosate.
- DO NOT apply more than 24 fl oz/A of Fusilade DX per application, 2 applications per year, or a total of 48 fl oz/A/year.
- Preharvest interval (PHI): 90 days
- Refer to Table 12 and the label for crop rotation restrictions.

TABLE 7B — Sugarbeet Herbicides — Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
glyphosate (see Table 10)	glyphosate	9	POST	0.75-1.13 lb ae (see Table 10) + AMS 17 lb/100 gal	RR

- **Apply to glyphosate-resistant (Roundup Ready) sugarbeet only.**
- Refer to Table 7A for weed control and crop tolerance ratings.
- There are several glyphosate products and formulations registered in Michigan. Refer to Table 10 and the label to determine application rates and additives needed for the different glyphosate products.
- Glyphosate DOES NOT have residual activity and will only control existing vegetation.
- For best results apply glyphosate at 1.13 lb ae/A. Lower application rates (0.75 lb ae/A) may be used to control smaller weeds (consult label). DO NOT apply below a minimum rate of 0.75 lb ae/A.
- Glyphosate-resistant sugarbeet should be planted in a weed-free seedbed. Apply 1.13 lb ae/A of glyphosate before annual weeds exceed 2-inches tall or when sugarbeets are at the 2-leaf stage. Subsequent applications of 0.75 lb ae/A of glyphosate should be made before additional weed flushes are 4 inches tall to maximize weed control. Two to four applications of glyphosate will be needed for season-long weed control and to maximize sugarbeet yield.
- Maximum in crop glyphosate applications include two applications prior to 8-leaf sugarbeets totaling 1.9 lb a.e./A and two applications after the 8-leaf stage until 30 days prior to harvest totaling 1.5 lb a.e./A.
- Challenges with this system include control of glyphosate-resistant weeds. Sequential applications that include PRE and/or POST tank-mixtures will be needed to control glyphosate-resistant weeds. Consult the the remarks and limitations section for the individual herbicides needed to control the following weeds:
  - Glyphosate-resistant waterhemp and Palmer amaranth control - Dual, Outlook, Warrant, and Nortron/Ethotron
  - Glyphosate-resistant horseweed - Stinger
  - Late-emerging grass control - Dual, Outlook, or Warrant
  - Volunteer corn control - Assure II, Fusilade DX, or Select Max
  - Volunteer soybean control - Stinger
  - Volunteer canola control - UpBeet
- The addition of micronutrient fertilizers (e.g., manganese) can antagonize glyphosate, resulting in a reduction in weed control. Avoid antagonisms by making separate herbicide and fertilizer applications or using a full-chelated form of the fertilizer and include ammonium sulfate.
- DO NOT exceed a combined total of 3.38 lb ae/A/year for in crop glyphosate applications or a total of 6 lb ae/A/year for all applications.
- Preharvest interval (PHI): 30 days
- Refer to Table 12 and the label for crop rotation restrictions.

Nortron, Ethotron 4SC	ethofumesate	15	PPI, PRE	3 pt	N
			POST	12 fl oz + MSO 1% v/v	N

- Refer to Table 7A for weed control and crop tolerance ratings.
- On sandy soils the Nortron/Ethotron rate can be reduced to 2 pt/A. Increase the rate to 4 pt/A on clay soils with heavy weed pressure.
- Soil-applied Nortron/Ethotron will suppress annual grasses and provide early-season waterhemp control.

Postemergence:
- Nortron/Ethotron can be applied with other herbicides labled for use in sugarbeet including glyphosate for additional weed control.
- Application rates postemergence are generally 12 fl oz/A in a single application or two applications of 6 fl oz/A. When applied POST it is recommended to include MSO + Dual Magnum, Outlook, or Warrant + glyphosate.
- More than one postemergence application can be made, but the total should not exceed 1 gallon/A/year.
- Preharvest interval (PHI): 90 days
- Rotation restrictions are reduced to 6 months if no more than 12 fl oz/A is applied. Refer to Table 12 and the label for crop rotation restrictions.

TABLE 7B — Sugarbeet Herbicides — Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
Outlook 6EC	dimethenamid-P	15	POST	16 fl oz	N

- Refer to Table 7A for weed control and crop tolerance ratings.
- Outlook can be applied at two different timings. 1) Normal timing: from 2-fully expanded true leaves to 8-leaf sugarbeets, and 2) Extended timing from 9- to 12-leaf sugarbeets.
- Applications prior to 2-leaf sugarbeets will result in significant crop injury and possible stand reduction.
- Crop safety is higher when applications are made after beets reach the 4-leaf stage.
- Postemergence applications will not control emerged weeds, but will provide residual control of annual grasses and some broadleaf weeds, including waterhemp and Palmer amaranth.
- Apply with with other herbicides labled for use in sugarbeet including glyphosate for residual weed control in glyphosate-resistant sugarbeets.
- Application rates are based on soil texture and organic matter (OM) – on coarse textured soils apply 12 to 14 fl oz/A on soils with less than 3% OM and 14 to 18 fl oz/A on soil with 3% or more OM; on medium and fine textured soils with less than 3% OM apply 14 to 18 fl oz/A and on soils with 3% OM or more apply 18 to 21 fl oz/A.
- Outlook can be applied in single application or split applications. Split applications should maintain a minimum of 14 days between applications.
- DO NOT apply more than 21 fl oz/A in a single application. In split applications, apply between 12 to 16 fl oz/A for the first application timing and the remainder of 8 to 12 fl oz/A in the second application timing, as long as the total amount of Outlook does not exceed 24 fl oz/A.
- Preharvest interval (PHI): 60 days (Normal timing); 95 days (Extended timing)
- Refer to Table 12 and the label for crop rotation restrictions.

Ro-Neet 6L	cycloate	15	PPI only	2 qt	N

- Refer to Table 7A for weed control and crop tolerance ratings.
- Incorporate Ro-Neet immediately after application into the upper 2-3 inches of soil.
- Use only on mineral soils. Injury may result from applications to highly saline or alkaline soils.
- DO NOT apply Nortron PRE after PPI applications of Ro-Neet.
- Ro-Neet can be applied PPI prior to POST glyphosate applications in glyphosate-resistant sugarbeet.
- Ro-Neet provides good velvetleaf suppression.
- Refer to Table 12 and the label for crop rotation restrictions.

Select Max 0.97EC	clethodim	1	POST	9 fl oz + NIS 0.25% v/v	N

- Select Max provides postemergence grass and volunteer corn control. Refer to Table 7A for weed control and crop tolerance ratings.
- Select Max rates range from 9 to 16 fl oz/A for annual grass and 12 to 32 fl oz/A for perennial grass control. Application rates are based on weed size and sensitivity. Refer to Table 2E for maximum weed sizes.
- COC/MSO (1% v/v) can replace NIS for certain tank-mixtures (see label).
- The addition of AMS at 2.5 to 4 lb/A has been shown to improve control of difficult to control weeds, e.g., quackgrass, rhizome johnsongrass, volunteer cereals, and volunteer corn.
- Apply 6 fl oz/A of Select Max for volunteer corn control up to 12 inches tall; 9 fl oz/A for corn up to 24 inches tall; and 12 fl oz/A for corn up to 36 inches tall. Select Max will control Enlist corn.
- For perennial grass contrl, higher rates (12 to 32 fl oz/A) and sequential applications may be needed.
- Select Max can be applied with other herbicides labled for use in sugarbeet including glyphosate.
- DO NOT apply more than 16 fl oz/A of Select Max per application, 4 applications per year, or a total of 64 fl oz/A/year.
- Preharvest interval (PHI): 30 days
- Refer to Table 12 and the label for crop rotation restrictions.

Sequence 5.25EW	glyphosate + s-metolachlor	9 15	POST	2.5 pt + AMS 17 lb/100 gal	RR

- **Apply to glyphosate-resistant (Roundup Ready) sugarbeet only.**
- Refer to Table 7A for weed control and crop tolerance ratings.
- Sequence at 2.5 pt/A contains 0.7 lb ae/A of glyphosate and 0.98 pt/A of Dual Magnum.
- Apply to sugarbeet from the 2-true leaf stage to canopy closure.
- Sequence is designed to control existing weeds and provide residual control of grasses and some small-seeded broadleaf weeds, including pigweeds (ie., waterhemp) and nightshade.
- On fine and medium textured soils, Sequence can be applied at 3 pt/A prior to 8-true leaf sugar beet.
- DO NOT exceed total maximum glyphosate use rate restrictions for glyphosate-resistant sugarbeet when using Sequence.
- DO NOT apply more than 7 pt/A of Sequence per season.
- Preharvest interval (PHI): 60 days
- Refer to Table 12 and the label for crop rotation restrictions.

TABLE 7B — Sugarbeet Herbicides — Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
Stinger HL 5EC	clopyralid	4	POST	2.4 fl oz	N
Stinger 3EC	clopyralid	4	POST	4 fl oz	N

- Refer to Table 7A for weed control and crop tolerance ratings.
- Additional weeds controlled with Stinger include: sweet clover, volunteer alfalfa, and volunteer glyphosate-resistant soybean.
- Apply when sugarbeets are in the cotyledon to the 8-leaf stage.
- Stinger can be applied with other herbicides labled for use in sugarbeet including glyphosate for additional weed control.
- For annual weed control, apply to actively growing broadleaf weeds up to the 5 leaf stage and wild buckwheat is in the 1-3 leaf stage.
- For Canada thistle control, apply Stinger HL at 3.2 fl oz/A and Stinger at 5.28 fl oz/A after sugarbeets have reached the third leaf pair and just prior to thistle flowering. For sowthistle control and Canada thistle control under drought conditions increase the Stinger HL rate to 4.8 fl oz/A and Stinger to 8 fl oz/A.
- Stinger HL at 1.2 to 2.4 fl oz/A or Stinger at 2 to 4 fl oz/A can be applied to control volunteer soybean.
- Stinger is the most effective herbicide to control glyphosate-resistant horseweed (marestail). A minimum of two applications of Stinger HL at 1.8 fl oz/A or Stinger at 3 fl oz/A are needed. Best results have been observed with three applications of Stinger HL at 1.2 fl oz/A followed by 2.4 fl oz/A followed by 2.4 fl oz/A or Stinger at 2 fl oz/A followed by 4 fl oz/A followed by 4 fl oz/A. However, crop rotation restrictions need to be considered.
- DO NOT exceed a total of 6.4 fl oz/A of Stinger HL or 10.7 fl oz/A of Stinger per year in all applications.
- Preharvest interval (PHI): 45 days
- The rotation interval for soybeans and dry beans is extended to 18 months if soils contain less than 2% organic matter and natural precipitation is less than 15 inches during the 10.5 months following treatment. Removal of plant residues and deep moldboard plowing can reduce the risk for crop injury in areas of low organic matter and less than 15 inches of rainfall. Refer to Table 12 and the label for additional crop rotation restrictions.

UpBeet 50WDG	triflusulfuron	2	POST	0.5 oz + NIS 0.25% v/v	N

- Refer to Table 7A for weed control and crop tolerance ratings.
- A temporary yellowing of sugarbeets can be expected after UpBeet application.
- Weeds need to be treated when they are small between the cotyledon and two true leaf stage.
- A minimum of two applications are needed to control velvetleaf and the addition of 2.5 lb/A of AMS is needed when velvetleaf has one to two true leaves.
- UpBeet can also be used to suppress/control volunteer glyphosate-resistant canola. Canola needs to be small, ideally the 2-leaf stage (<4-inches tall). UpBeet will need to be applied twice with MSO (1% v/v) approximately 7 days apart. In some years, a third application of UpBeet may be needed.
- DO NOT apply more than 1 oz/A in a single application or more than a total of 2.5 oz/A/year.
- Preharvest interval (PHI): 60 days
- Refer to Table 12 and the label for crop rotation restrictions.

Warrant/Enversa 3SC	acetochlor	15	POST	3 pt	N

- Refer to Table 7A for weed control and crop tolerance ratings.
- Warrant/Enversa can be applied from 2-fully expanded true leaves to 8-leaf sugarbeets.
- Applications prior to 2-leaf sugarbeets will result in significant crop injury and possible stand reduction.
- Crop safety is higher when applications are made after beets reach the 4-leaf stage.
- Postemergence applications will not control emerged weeds, but will provide residual control of annual grasses and some broadleaf weeds, including waterhemp, Palmer amaranth, and nightshade.
- Apply with other herbicides labled for use in sugarbeet including glyphosate for residual weed control in glyphosate-resistant sugarbeets.
- More than one application can be made with at least 7 days between applications, but the total should not exceed 8 pt/A/year.
- Preharvest interval (PHI): 70 days
- If a sugarbeet stand is lost, replanting sugarbeet after a Warrant application is not recommended and may result in significant crop injury. Refer to Table 12 and the label for additional crop rotation restrictions.