

Table 1. PRE and POST Herbicide Diversification Options for Glyphosate-Resistant Corn

Prepared by Tom Peters (U of MN / NDSU Weed Science) with input from Jared Goplen (U of MN) and Joe Ikley (NDSU Weed Science)

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Herbicides to Complement Glyphosate						
SOA #	PRE as part of sequential with glyphosate	Common ragweed	Giant ragweed	Kochia	Lambsquarters	Waterhemp
5,15,27	Acuron / Acuron Flexi	E	G/E	E	E	E
5	Atrazine (0.38 lb ai/A) (POST only in ND)	P	F	F/E	F	P/F
27	Balance Flexx (Not labeled SE MN or North of I-94)	G/E	F/G	G/E	E	G
27	Callisto	G/E	G	P	G/E	G/E
2,27	Corvus (Not labeled in SE MN or North of I-94)	G-E	G	E	E	E
14,15	Fierce EZ (7 day preplant restriction)	P	P/F	F/E	F/G	G
15	Harness / Surpass / Breakfree NXT (acetochlor)	N/P	N	P/F	F/G	G
15	Other Acetamides (Dual, Outlook, Cinch)	N/P	N	N/P	P/F	F/G
2,27	Instigate	F/G	F/G	P/F	E	G/E
4,15,27	Resicore	E	G/E	P/F	E	G/E
14	Sharpen (2-4 oz/A)	G/E	G	E	E	G/E
2,4,15	SureStart II / TripleFLEX II	F/G	F/G	P/G	G/E	P
14,15	Verdict (10 - 18 fl oz/A)	G/E	F/G	E	E	E
15	Zidua SC (1.75 - 6.5 fl oz/A)	P	P	F	P/F	G

POST as part of tank-mix with glyphosate						
5	Atrazine (0.38 lb ai/A)	P	G	F	F	P/F
5, 15, 27	Armezon Pro + atrazine	E	E	E	E	E
4	Banvel / Clarity (dicamba)	E	G	F/G	G/E	F/G
27	Callisto + atrazine	F	G	E	E	E
2,27	Capreno + atrazine	E	G	G/E	E	E
4	Diflexx	G/E	G	G/E	G	G
4, 27	DiFlexx Duo	E	E	E	E	G/E
9,15,27	Halex GT	E	G	E	E	G/E
15, 27	Impact / Armezon + atrazine	E	G	E	E	G/E
27	Laudis + atrazine	E	G	E	E	E
4,19	Status	E	G/E	G/E	G/E	G/E

Alternative Technologies						
10	Liberty 280 in LL Corn	F/E	G/E	F/E	F/E	F/E

E = Excellent, 90 to 99% control, G = Good, 80 to 90% control, F = Fair, 65 to 80% control, P = 40 to 65% control, N = None, no control

SOA = Site of action is defined as the biochemical site at which the herbicide binds to control a plant

Note: be aware of biotypes that are resistant to treatments

Note: strengths and weakness and PRO's and CON's of PRE's such as crop injury potential under cool/wet conditions

Note: problems with timing, crop injury potential, and volunteer crops of POST herbicides

Note: problems with timing, crop injury potential, and off-target injury of tank mixtures

Table 2. PRE and POST Herbicide Diversification Options for Glyphosate-Resistant Corn - Crop Rotation

Prepared by Tom Peters (U of MN / NDSU Weed Science) with input from Jared Goplen (U of MN) and Joe Ikley (NDSU Weed Science)

Herbicides to Complement Glyphosate		Herbicide Crop Rotation Interval (Months)					
SOA #	PRE as part of sequential with glyphosate	Dry bean	Pea	Potato	Soybean	Sugarbeet	Wheat
5,15,27	Acuron	18	18	10	10	18	4
5	Atrazine (0.38 lb ai/A)	NCS	NCS	NCS	10	NCS b	NCS
27	Balance Flexx (Not labeled SE MN or North of I-94)	18	18	6	6	18	6
27	Callisto	18	10/18 a	10	10	18	4
2,27	Corvus (Not labeled in SE MN or North of I-94)	17-24 a	17-24 a	17-24 a	9	17-24 a	4
14,15	Fierce EZ (7 day preplant restriction)	11	6	4	0	15	4
15	Harness / Surpass (acetochlor)	NCS	NCS	NCS	NCS	NCS	4
15	Other Acetamides (Dual, Outlook)	0	NCS	0	0	NCS	4.5
2,27	Instigate	18	18	10	10	18	9
4, 15, 27	Resicore	18	18	18	10.5	18	4
14	Sharpen (2 oz/A)	5	0	5	3	5	0
14	Sharpen (3 oz/A)	6	2	6	3	6	0
2,4,15	SureStart II / TripleFLEX II	12-18	NCS	18	NCS j	26 b	4
14,15	Verdict (10 - 18 fl oz/A)	NCS	NCS	NCS	NCS	NCS	NCS
15	Zidua SC (1.75 - 6.5 fl oz/A)	11	8	4	4	15	6

POST as part of tank mix with glyphosate							
5	Atrazine (0.38 lb ai/A)	NCS	NCS	NCS	10	NCS b	NCS
5, 15, 27	Armezon Pro + atrazine (less than 20 fl oz/A)	18n	9	9	9	18	3
4	Banvel / Clarity (dicamba)	4	4	4	4	4	22 d
27	Callisto + atrazine	18	18	10	10	18	4
2,27	Capreno + atrazine	18 a	18 a	18 a	10	18 a	4
4	Diflexx	4	4	4	4	4	4
4, 27	Diflexx Duo	10	18	10	6	10	4
27	Impact / Armezon + atrazine	18 n	18n	9	9	18	3
27	Laudis + atrazine	10 g - 18 a	10 - NCS	10 - NCS	10	10 g - NCS b	4
4,19	Status	4	4	4	1 to 4	4	1

Alternative Technologies							
10	Liberty in LL Corn	6	6	70 d	0	0	70 d

SOA = Site of action is defined as the biochemical site at which the herbicide binds to control a plant

Shading = Herbicides requiring ≥2 years before planting sugarbeets

NCS = Next Cropping Season

a = refer to the label

b = including a successful bioassay

d = days

g = cumulative precipitation between application and planting of rotational crop > 20 inches

j = requires 15 inches of precipitation during the growing season after application

n = depending on rate

Table 3. PRE and POST Herbicide Diversification Options for Glyphosate-Resistant Soybean

Prepared by Tom Peters (U of MN / NDSU Weed Science) with input from Jared Goplen (U of MN) and Joe Ikley (NDSU Weed Science)

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Herbicides to Complement Glyphosate						
SOA #	PRE as part of sequential with glyphosate	Common ragweed	Giant ragweed	Kochia	Lambsquarters	Waterhemp
2,14	Authority Assist	N	P	E	G/E	F/E
14,15	Authority Elite / BroadAxe XC	N	N	G/E	G/E	G/E
2,14	Authority First / Sonic	G/E	G/E	F/E	G/E	F/E
5,14	Authority MTZ	F/G	P/F	F/E	G/E	F/E
14, 15	Authority Edge / Supreme	N	N	F-E	G-E	G-E
5,15	Boundary	P/F	P	F/G	G	G/E
14,15	Fierce	P	F	F/E	F/E	G/E
5, 14, 15	Fierce MTZ	P/F	P	F/E	F/E	G/E
5	Metribuzin (generic Sencor)	P/F	P	F/G	P/G	P/G
3	Prowl	N	N	P	F/G	F/G
14	Sharpen (1 oz/A)	P	P	P	F	F
14	Spartan	N	N	F/E	G/E	F/E
2,14	Surveil	G/E	G/E	G	G/E	G
3	Treflan/Sonalan	N	P	P	F/G	F/G
14	Valor / Rowel	N/P	P/F	P/G	F/E	G
14,15	Verdict (5 fl oz/A)	P/F	P	P	F/G	F/G
PRE and/or Early POST as tank mix with glyphosate (PRE to Weeds, POST to Soybean)						
15	Acetamides (Dual, Outlook)	N	N	N/P	P/F	F/G
14,15	Prefix (E. of I-29 and S. of I-94 Only)	G	G/E	F	P	G/E
15	Warrant	N	N	N/P	F/G	F/E
14,15	Warrant Ultra (E. of I-29 and S. of I-94 Only)	G	G/E	F	G	G
15	Zidua (1 - 3.5 oz/A)	P	P	F/E	F/E	G/E
POST as part of tank mix with glyphosate						
14	Cobra / Phoenix	P/E	F/G	P/F	N/P	P/G
2	FirstRate	N	G/E	P	P	N
14	Flexstar (Maximum rate depends on location)	P/E	G	G/E	P/F	P/E
9,14	Flexstar GT (E. of US 281 and S. of US 2, see footnote)	G/E	G	G/E	G/E	G/E
2	Pursuit	N	P	N	P	N
14	Resource	F	P	P	F	F
Alternative Technologies						
10	Liberty 280 in LL Soybean	F/E	G/E	F/E	F/E	F/E
4	Engenia, XtendiMax or FeXapan in Roundup Xtend Soybean	E	E	E	E	P/E
4	Enlist in Enlist Soybean	E	E	P-E	E	P-E

E = Excellent, 90 to 99% control, G = Good, 80 to 90% control, F = Fair, 65 to 80% control, P = 40 to 65% control, N = None, no control
 SOA = Site of action is defined as the biochemical site at which the herbicide binds to control a plant

Note: strengths and weakness and PRO's and CON's of PRE's such as crop injury potential under cool/wet conditions

Note: problems with timing, crop injury potential, and vol. crops of POST herbicides

Note: problems with timing, crop injury potential, and off-target injury of tank mixtures

Flexstar GT at 2.68 pt/A in areas east of US 281 in North Dakota and areas south of US 2 in Minnesota plus Beltrami, Clearwater, Lake of the Woods, Kittson, Marshall, Pennington, Pok, Red Lake, and Roseau. Flexstar GT at 3.5 pt/A has a restricted area.

Table 4. PRE and POST Herbicide Diversification Options for Glyphosate-Resistant Soybean - Crop Rotation

Prepared by Tom Peters (U of MN / NDSU Weed Science) with input from Jared Goplen (U of MN) and Joe Ikley (NDSU Weed Science)

Herbicides to Complement Glyphosate							
SOA #	PRE as part of sequential with glyphosate	Herbicide Crop Rotation Interval (Months)					
		Corn	Pea	Dry bean	Potato	Sugarbeet	Wheat
2,14	Authority Assist	10	4	4	26	40 b	4
14,15	Authority Elite / BroadAxe XC	10	0	0	4	36 b	4.5
2,14	Authority First / Sonic	10	12	12	18	30 b	4
5,14	Authority MTZ	10	18	12	12	24 b	4
14, 15	Authority Supreme	10	0	9	4	24 b	4 to 6
5,15	Boundary	4	8	12	0	18	8
14,15	Fierce EZ	7-30 d	6	11	4	15	1 to 2
5, 14, 15	Fierce MTZ	7-30 d	11	11	12	18	8
2	FirstRate	9	9	9	18	30 b	4
5	Metribuzin (generic Sencor)	4	8	12	12	18	8 u
3	Prowl	0	0	0	0	12 (2CS)	NCS
14	Sharpen (1 oz/A)	0	0	4	4	4	0
14	Spartan	4	0	0	4	24 b	4
2,14	Surveil	9	9	9	18	30 b	3
3	Treflan	NCS	0	0	0	12 (2CS)	NCS
14	Valor / Rowel	0.5 - 1	3 - 4	3 - 4	4 - 10	5 - 10	0.5 - 2
14,15	Verdict (5 fl oz/A)	0	0	4	4	4	0

PRE and/or Early POST as tank mix with glyphosate (PRE to Weeds)							
15	Acetanalides (Dual, Outlook)	0	NCS	0	0	NCS	4 - 4.5
14,15	Prefix (<i>E. of I-29 and S. of I-94 Only</i>)	10	10	0	0	18	4.5
15	Warrant	NCS	NCS	NCS	NCS	NCS	4
14,15	Warrant Ultra (<i>E. of I-29 and S. of I-94 Only</i>)	10	10	NCS	NCS	18	4
15	Zidua (> 2.0 oz/A)	0	4 - 8	11	4	12 - 15	0 - 6

POST as part of tank mix with glyphosate							
14	Cobra / Phoenix	0	0	0	0	0	0
2	FirstRate	9	9	9	18	30 b	4
14	Flexstar (Maximum rate depends on location)	10	12	0	0	18	4
9,14	Flexstar GT (<i>E. of US 281 and S. of US 2</i>)	10	4	0	0	18	4
2	Pursuit (up to 3 fl oz/A)	8.5	0	0	26	40 b	4
14	Resource	0	1	1	1	1	1

Alternative Technologies							
10	Liberty in LL Soybean	0	6	6	70 d	0	70 d
4	Engenia, XtendiMax or FeXapan in Roundup	1	120 d	120 d	120 d	120 d	44 d e
4	Enlist in Enlist Soybean	0	0	0	0	0	0

SOA = Site of action is defined as the biochemical site at which the herbicide binds to control a plant

Shading = Herbicides requiring ≥2 years before planting sugarbeets

NCS = Next Cropping Season

2CS = 2 Cropping Seasons

() = Recommended interval

b = Including a successful bioassay

d = days

u = add 2 months if soil pH is 7.5 or above

e = interval is less in geographies with greater than 30 inches annual precipitation