

## **SURVEY OF FUNGICIDE USE IN SUGARBEET IN MINNESOTA AND EASTERN NORTH DAKOTA IN 2016**

Peter C. Hakk<sup>1</sup>, Andrew B. Lueck<sup>1</sup>, Thomas J. Peters<sup>2</sup>, Mohamed F.R. Khan<sup>2</sup>, and Mark A. Boetel<sup>3</sup>

<sup>1</sup>Sugarbeet Research Specialists and <sup>2</sup>Extension Sugarbeet Specialists  
North Dakota State University - University of Minnesota, Fargo, ND  
and

<sup>3</sup>Professor, Dept. of Entomology, North Dakota State University

Other portions of the survey are published in the Weed Control and Entomology sections.

Sugarbeet growers were asked to report the fungicide used and the number of applications to sugarbeet acreage as part of the annual survey of sugarbeet growers. Multiple applications of fungicides to the same acreage were counted as multiple acres treated; thus, acres treated may exceed 100% of acres planted. All fungicides in Table 1 would be used primarily for control of *Cercospora* leaf spot (CLS).

Fungicide use for CLS in 2016, averaged over all counties, was 395% of respondent acres as compared to 296% of respondent acres in 2015, 179% in 2014, 218% in 2013, 277% in 2012, 259% in 2011, 225% in 2010, 156% in 2009, 222% in 2008 and 242% in 2007 (Table 1). Acres not treated with fungicide were 0% of respondents in 2016 as compared to 0% in 2015, 3% in 2014, 4% in 2013, 11% in 2012, 3% in 2011 and 2010, 9% in 2009, less than 1% in 2008, 1% in 2007 and 2% in 2006. Fungicide usage was greatest in Chippewa County in 2016 with 637% of respondent acres receiving fungicides for control of CLS. The greatest fungicide used in 2015 was in Renville County with 442%. The greatest fungicide used in 2014 was in Renville County in 2014 with 283% of respondent acres receiving fungicides for control of CLS. The greatest fungicide used in 2013 was in Chippewa County with 352%, 2012 was in Chippewa County with 476%, 2011 was in Chippewa County with 343%, 2010 was in Kandiyohi County with 437%, 2009 was in Renville County with 284%, 2008 was in Renville County with 302%, 2007 in Renville County with 348%, and in 1998 in Chippewa County with 852%. Tin + Topsin, Super/Agri Tin, Proline, Inspire XT and Headline were the most commonly used fungicides in 2016 and were used on 71%, 61%, 61%, 47% and 47% of the acres respectively.

The percentage of respondents who named *Cercospora* as their worst production problem in sugarbeet was 36% in 1998, 3% in 2000, <1% in 2002 and 2003, 0% in 2004 and 2005, <1% in 2006, 2007, and 2008, 1% in 2009, 3% in 2010, 1% in 2011, 7% in 2012, <1% in 2013, 0% in 2014, 12% in 2015 and 45% in 2016. Triazoles, either by themselves or in tank-mixtures, were applied to 127% of respondent acres in 2016, compared to 95% of respondent acres in 2015, 69% in 2014, 58% in 2013, in 2012, 97% in 2011, and 88% in 2010. Headline was used on 47% of the sugarbeet acreage in 2016, 51% in 2015, 65% in 2014, 70% in 2013, 71% in 2012, 88% in 2011, 87% in 2010, 68% in 2009, 90% in 2008, 82% in 2007, 84% in 2006, 72% in 2005, 52% in 2004, and 85% in 2003. In 2015, 2014, 2013, 2012, 2011, 2010, and 2009, Headline was the only fungicide to be applied by respondents from all counties. Prior to 2009, the most recent occurrence of only one fungicide being applied by respondents from all counties was in 1997 and the fungicide was Super Tin. QOI fungicides (Headline, Gem and Priaxor) were applied either alone or in tank mixtures to 94% of acres in 2016, 88% in 2015, 71% in 2014, 78% in 2013, 77% in 2012, 91% in 2011, and 89% in 2010.

The number of fungicide applications varied from two to seven times per respondent in 2016 (Table 2). The average number of applications per acre was 4.0 in 2016, 3.0 in 2015, 1.8 in 2014, 2.2 in 2013, 2.8 in 2012, 2.6 in 2011, 2.3 in 2010, 1.6 in 2009, 2.2 in 2008, 2.4 in 2007, 2.1 in 2006, 2005, and 2004, 2.8 in 2003 and 2.6 in 2002.

Averaged over fungicides and counties, 78% of treated acres were sprayed with a ground sprayer while 22% were treated with an aerial sprayer in 2016 (Table 3). The usage of ground sprayers ranged from 0% in Walsh County to 100% in Cass, Kittson, Marshall and Traill Counties. The overall usage of ground sprayers was 95% in 2015, 86% in 2014, 85% in 2013, 82% in 2012, 78% in 2011 and 2010, 86% in 2009, 77% in 2008 and 2007.

The date of the first fungicide application for *Cercospora* ranged from June 20-30 to August 1-10 (Table 4). Southern areas generally were sprayed earlier than northern areas. Thirty nine percent of respondents began spraying

prior to July 11 in 2016, while 33% of respondents in 2015, 4% in 2014, 10% in 2013, 12% in 2011, 2010, and 2009, 5% in 2008 and 22% in 2007 began spraying for *Cercospora* prior to July 11.

The date of the last fungicide application ranged from before August 1 to after September 10 (Table 5). The last fungicide application was after August 20 by 87% of the respondents and after August 31 by 58% of the respondents. The last fungicide application was before August 11 by 8% of the respondents.

*Cercospora* leaf spot control was evaluated as excellent or good by 57% of the survey respondents averaged over all fungicides (Table 6). Fifteen percent of responses indicated a poor level of CLS control.

Field failures were reported due to *Cercospora* leaf spot in 2016. Seven percent of fields that failed were between August 1-15, 27% were between August 16-31, 40% were between September 1-15 and 27% were September 16 or later (Table 7).

Fungicides were evaluated for *Rhizoctonia* control in 2016 (Table 8). Thirty five post emergence responses were reported. 86% of respondents applied Quadris, 9% of respondents applied Priaxor 3% applied Proline. The response 'Other' was reported by 3% of respondents. Respondents indicated they received excellent control of *Rhizoctonia* with post emergence fungicide 14% of the time, good control 54% of the time and a fair amount of control 26% of the time. Thirty eight percent of respondents indicated a post emergence fungicide applied from June 1 to 15 (Table 9). Current recommendations for controlling *Rhizoctonia* include the use of tolerant varieties, in-furrow fungicide applications in areas with heavy disease pressure, fungicidal seed treatments and timely post-emergent fungicide applications. Post-emergent fungicides should be applied just before a ¼ to ½ inch rainfall so that the fungicide can be transported into the soil and close to the roots.

An evaluation of satisfaction of seed treatments was conducted (Table 10). One hundred percent of respondents said they were satisfied or very satisfied with Vibrance, 99% of respondents said they were satisfied or very satisfied with Kabina, 98% of respondents said they were satisfied or very satisfied with Tachigaren, 92% of respondents reported being satisfied or very satisfied with Metlock + Rizolex + Kabina and 80% of respondents said that they were satisfied or very satisfied with Metlock + Rizolex in 2016. Twenty percent of respondents in 2016 reported being unsatisfied with Metlock + Rizolex, 2% reported being unsatisfied with Tachigaren and 1% were unsatisfied with Kabina.

Lime rates were evaluated for satisfaction in 2016 (Table 11). One hundred percent of respondents said they were either satisfied or very satisfied with spreading the high rate (10+ Ton/A) of lime while 72% were also either very satisfied or satisfied with spreading the mid rate (5-10 Ton/A) of lime. Sixty percent of respondents were either satisfied or very satisfied with spreading the low rate (<5 Ton/A) of lime.

**Table 1. Fungicide use for Cercospora control by survey respondents in 2016.**

Table 1. Fungicide use for Cereospora control by survey respondents in 2010.																
County	Respondent		Super/		Triazoles			QOIs			Tank-mixes				Total acres treated	
	acres planted <sup>5</sup>	Not treated	Agri Tin	Top-sin	Pro-line	Min-erva	Inspire XT	Head-line	Gem	Pri-axor <sup>6</sup>	Tin+ Topsin	Tin+ Copper	EBDC + Tin	EBDC + Triazole		Other <sup>7</sup>
	-----% of acres planted-----															
Cass	1,050	-	100	-	94	76	-	94	-	59	-	-	-	-	100	465
Chippewa <sup>1</sup>	3,296	-	200	-	52	12	52	-	41	59	51	-	-	83	86	637
Clay <sup>2</sup>	4,060	-	110	-	-	-	94	108	-	27	77	9	-	-	6	431
Grand Forks	7,568	-	40	11	95	-	55	31	-	49	77	-	-	-	10	368
Kittson	1,155	-	77	-	77	-	23	23	-	-	23	-	-	-	-	223
Marshall	2,383	-	27	-	58	-	-	53	-	30	-	-	-	-	-	167
Norman	3,017	-	88	-	-	-	100	97	-	-	100	-	-	-	27	411
Pembina	2,077	-	39	26	65	-	35	-	-	102	6	-	-	-	-	273
Polk <sup>3</sup>	13,121	-	39	5	67	21	18	26	-	69	77	-	-	-	14	336
Renville	820	-	185	-	98	39	-	29	61	39	24	-	-	-	49	524
Richland	2,564	-	15	57	87	13	87	27	-	65	43	27	-	-	-	421
Traill	300	-	100	-	-	-	-	-	-	100	100	-	-	-	-	300
Traverse <sup>4</sup>	5,665	-	29	-	61	61	62	95	-	9	124	25	24	-	30	519
Walsh	817	-	-	-	100	-	-	-	-	-	100	-	38	-	-	238
Wilkin	3,368	-	70	-	42	42	73	73	-	27	89	-	-	-	39	455
Total	51,261	-	61	7	61	19	47	47	4	43	71	5	3	5	21	395

<sup>1</sup>Includes Kandiyohi and Swift Counties

<sup>2</sup>Includes Becker County

<sup>3</sup>Includes Pennington County

<sup>4</sup>Includes Grant and Stevens Counties

<sup>5</sup>Respondent acres planted does not include acres by respondents who skipped the cercospora questions on the survey.

<sup>6</sup>Priaxor is a mixture of a QOI and SDHI

<sup>7</sup>Other includes: Tin + QOI, Copper + Topsin, QOI + QOI, Other + Inspire XT, Other alone, Other + EBDC, Other + Tin, Copper alone, Other + Priaxor and EBDC alone.

**Table 2. Number of fungicide applications by survey respondents in 2016.**

		Number of Applications per Respondent							
County	Respondents	0	1	2	3	4	5	6	7
		-----% of respondents-----							
Cass	2	0	0	0	0	50	50	0	0
Chippewa <sup>1</sup>	4	0	0	0	0	0	25	25	50
Clay <sup>2</sup>	6	0	0	0	17	67	17	0	0
Grand Forks	10	0	0	10	30	40	20	0	0
Kittson	2	0	0	50	50	0	0	0	0
Marshall	4	0	0	100	0	0	0	0	0
Norman	2	0	0	0	0	50	50	0	0
Pembina	4	0	0	25	50	25	0	0	0
Polk <sup>3</sup>	22	0	0	5	45	41	9	0	0
Renville	3	0	0	0	0	33	0	33	33
Richland	4	0	0	0	0	25	75	0	0
Traill	1	0	0	0	0	100	0	0	0
Traverse <sup>4</sup>	6	0	0	0	0	17	50	33	0
Walsh	1	0	0	0	100	0	0	0	0
Wilkin	6	0	0	0	0	33	67	0	0
Total	77	0	0	10	23	34	23	5	4

<sup>1</sup>Includes Kandiyohi and Swift Counties

<sup>2</sup>Includes Becker County

<sup>3</sup>Includes Pennington County

<sup>4</sup>Includes Grant and Stevens Counties

**Table 3. Ground and aerial application of fungicides in 2016.**

County	Treated Acres	Ground	Aerial
-----% of treated acres-----			
Cass	5,000	100	-
Chippewa <sup>1</sup>	12,389	93	7
Clay <sup>2</sup>	17,005	94	6
Grand Forks	28,229	94	6
Kittson	2,570	100	-
Marshall	4,766	100	-
Norman	14,668	82	18
Pembina	5,563	98	2
Polk <sup>3</sup>	46,924	65	35
Renville	4,580	67	33
Richland	11,357	87	13
Traill	1,200	100	-
Traverse <sup>4</sup>	28,485	80	20
Walsh	2,451	-	100
Wilkin	15,961	79	21
Total	211,123	78	22

<sup>1</sup>Includes Kandiyohi and Swift Counties<sup>2</sup>Includes Becker County<sup>3</sup>Includes Pennington County<sup>4</sup>Includes Grant and Stevens Counties**Table 4. Date of first fungicide application for CLS in 2016.**

County	Number of Respondents	June 20-30	July 1-10	July 11-20	July 21-31	Aug. 1-10	After Aug. 10
-----% of respondents-----							
Cass	2	0	50	50	0	0	0
Chippewa <sup>1</sup>	4	50	50	0	0	0	0
Clay <sup>2</sup>	6	17	50	33	0	0	0
Grand Forks	10	10	10	50	20	10	0
Kittson	2	0	0	50	50	0	0
Marshall	4	0	0	25	25	50	0
Norman	2	0	0	100	0	0	0
Pembina	4	25	0	50	0	25	0
Polk <sup>3</sup>	22	0	14	41	45	0	0
Renville	3	0	100	0	0	0	0
Richland	4	0	50	25	25	0	0
Traill	1	0	0	100	0	0	0
Traverse <sup>4</sup>	6	33	67	0	0	0	0
Walsh	1	0	0	0	100	0	0
Wilkin	6	17	50	33	0	0	0
Total	77	10	29	35	21	5	0

<sup>1</sup>Includes Kandiyohi and Swift Counties<sup>2</sup>Includes Becker County<sup>3</sup>Includes Pennington County<sup>4</sup>Includes Grant and Stevens Counties

**Table 5. Date of last fungicide application for CLS in 2016.**

County	Number of Respondents	Before Aug. 1	Aug. 1-10	Aug. 11-20	Aug. 21-31	Sept. 1-10	After Sept. 10
-----% of respondents-----							
Cass	2	0	50	0	50	0	0
Chippewa <sup>1</sup>	4	0	0	25	25	25	25
Clay <sup>2</sup>	6	17	0	0	33	50	0
Grand Forks	10	0	0	0	30	30	40
Kittson	2	0	0	50	0	0	50
Marshall	4	0	0	0	50	50	0
Norman	2	0	0	0	0	0	100
Pembina	4	25	25	0	25	25	0
Polk <sup>3</sup>	22	5	5	9	36	27	18
Renville	3	0	0	0	33	0	67
Richland	4	0	0	0	0	50	50
Traill	1	0	0	0	100	0	0
Traverse <sup>4</sup>	6	0	0	0	0	83	17
Walsh	1	0	0	0	100	0	0
Wilkin	6	0	0	0	17	83	0
Total	77	4	4	5	29	36	22

<sup>1</sup>Includes Kandiyohi and Swift Counties<sup>2</sup>Includes Becker County<sup>3</sup>Includes Pennington County<sup>4</sup>Includes Grant and Stevens Counties**Table 6. Fungicide control of Cercospora leafspot in 2016.**

Fungicide	Number of Responses	Excellent	Good	Fair	Poor	Unsure
-----% of responses-----						
Super Tin/Agri Tin	51	16	37	29	18	-
Topsin	7	14	71	14	-	-
Proline	47	19	49	19	13	-
Minerva	14	7	57	14	21	-
Inspire XT	33	24	39	33	3	-
Headline	38	11	32	32	26	-
Priaxor	38	29	37	32	3	-
Gem	3	-	-	33	67	-
Tin+Topsin	51	22	43	25	10	-
Tin+Copper	4	-	25	50	25	-
Tin+EBDC	2	-	-	-	100	-
Triazole+EBDC	3	-	-	100	-	-
Other <sup>1</sup>	18	11	28	28	33	-
Total	309	18	39	28	15	-

<sup>1</sup> Other includes: Tin + QOI, Copper + Topsin, QOI + QOI, Other + Inspire XT, Other alone, Other + EBDC, Other + Tin, Copper alone, Other + Priaxor and EBDC alone.**Table 7. Date of field failure due to CLS in 2016**

No. of Responses	Before 1-Aug	Aug 1-15	August 16-31	Sept 1-15	16-Sep or after
-----% of responses-----					
15	0	7	27	40	27

**Table 8. Evaluation of fungicides for Rhizoctonia control and crop injury in 2016.**

Application Method		Acres	Rhizoctonia Control				
			Responses	Exc	Good	Fair	Poor
Fungicide	Treated						
Foliar			-----% of responses-----				
Quadris	16,111	30	17	47	30	7	0
Priaxor	1,408	3	0	100	0	0	0
Proline	735	1	0	100	0	0	0
Other	450	1	0	100	0	0	0
Total	18,704	35	14	54	26	6	0

**Table 9. Date of POST fungicide application for Rhizoctonia control in sugarbeet in 2016.**

Fungicide	No. of Responses	Before May 1	May 1-15	May 16-31	June 1-15	June 16-30	July 1 or after
-----% of responses-----							
Quadris	30	3	7	47	40	3	0
Priaxor	2	0	50	0	50	0	0
Proline	1	0	0	0	0	0	100
Other	1	0	0	100	0	0	0
Total	34	3	9	44	38	3	3

**Table 10. Rating of seed treatment performance in sugarbeet in 2016.**

Seed Treatment	Acres Treated	Responses	Very Satisfied	Satisfied	Unsatisfied	No Response
-----% of responses-----						
Kabina	41,993	67	31	67	1	-
Metlock+Rizolex	665	5	20	60	20	-
Metlock+Rizolex+Kabina	3,123	13	23	69	-	8
Vibrance	3,358	11	18	82	-	-
Tachigaren	26,340	50	30	68	2	-
Total	75,479	146	29	68	2	1

**Table 11. Use of Lime for controlling Aphanomyces in 2016.**

Lime Rate	Responses	Very Satisfied	Satisfied	Unsatisfied	No Response
-----% of responses-----					
<5 Ton/A	5	40	20	40	-
5-10 Ton/a	25	32	40	8	20
10+ Ton/A	1	-	100	-	-
Total	31	32	39	13	16