SURVEY OF FUNGICIDE USE IN SUGARBEET IN MINNESOTA AND EASTERN NORTH DAKOTA IN 2012

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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 2012, averaged over all counties, was 277% of respondent acres as compared to 259% in 2011, 225% in 2010, 156% in 2009, 222% in 2008, 242% in 2007, 208 % in 2006, and 206% in 2005 (Table 1). Acres not treated with fungicide were 11% in 2012, compared to 3% in 2011 and 2010, 9% in 2009, less than 1% in 2008, 1% in 2007, 2% in 2006, and 6% in 2005. Fungicide usage was greatest in Chippewa County in 2012 with 476% of respondent acres receiving fungicide for control of CLS. The greatest fungicide use in 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%, 2006 in Renville County with 335%, 2005 in Renville County with 304%, and in 1998 in Chippewa County with 852%. Headline, Super/Agri Tin, Proline, and Tin+Topsin were the most commonly used fungicides in 2012 and were used on 71%, 51%, 41% and 37% of the acres, respectively.

Eminent had a Section 18 label from 1999 through 2004 and was fully labeled in 2005. Eminent was used on 4% of the acreage in 2012 (Table 1), 9% in 2011, 57% in 2010, 25% in 2009, 54% in 2008, 72% in 2007, 60% in 2006, and 78% in 2005. Eminent usage has declined the past two years due to reduced efficacy when applied under high disease pressure in field trials and in growers' fields. Headline was fully labeled for use in sugarbeet in 2002. Headline was used on 71% of the sugarbeet acreage 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. Eminent and Headline use has had a large impact on Cercospora control as the percentage of respondents who named Cercospora as their worst production problem in sugarbeet dropped from 36% in 1998 to 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, and 6% in 2012. 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. In 2012, 2011, 2010, and 2009, Headline was the only fungicide to be applied by respondents from all counties. An increased dependence on Headline without the alternation of other fungicide chemistries could result in increased levels of resistance by *Cercospora beticola* to strobilurin fungicides.

The number of fungicide applications varied from zero to six times per respondent in 2012 (Table 2). The average number of applications per acre was 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, 2.6 in 2002, and 2.5 in 2001.

Averaged over fungicides and counties, 82% of treated acres were sprayed with a ground sprayer while 16% were treated with an aerial sprayer in 2012(Table 3). The usage of ground sprayers ranged from 17% in Traill County to 100% in several counties. The overall usage of ground sprayers was 78% in 2011 and 2010, 86% in 2009, 77% in 2008, 2007, and 2006, and 79% in 2005.

The date of the first fungicide application for Cercospora ranged from June 20 to after August 10 (Table 4). Southern areas generally were sprayed earlier than northern areas. Thirty three percent of respondents began spraying prior to July 11 in 2012, while12% of respondents in 2011, 2010, and 2009, 5% in 2008, 22% in 2007, 12% in 2006 and 2005, 33% in 2003, and 22% in 2001 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 32% of the respondents. The last fungicide application was before August 11 by 6% of the respondents.

Cercospora leaf spot control was evaluated as excellent or good by 86% of the survey respondents averaged over all fungicides (Table 6). Four percent of responses indicated an unsure level of CLS control.

The reported sugarbeet acreage believed to be damaged by Aphanomyces, Rhizoctonia, Fusarium, and Rhizomania in 2012 are 4% damaged by Aphanomyces, 21% damaged by Rhizoctonia, 1% damaged by Fusarium, and 1% damaged by Rhizomania (Table 7). Forty-three percent of survey respondents reported Rhizoctonia/Aphanomyces as their number one production problem in 2012. Rhizoctonia/Aphanomyces has been the number one worst production problem reported since 2009**.** Continuing efforts are needed to develop and refine control measures for these root diseases, particularly Rhizoctonia.

Fungicides were evaluated for Rhizoctonia control and crop injury in 2012 (Table 8). Twenty-five responses were reported for in-furrow fungicide applications. Headline was applied in-furrow in 76% of responses, while Quadris was applied in-furrow in 24%. Ninety-one post emergence responses were reported. Quadris was applied in 67% of responses while Proline and Headline were applied in 24% and 9% respectively.

Twenty-one percent of responses indicated a post emergence fungicide applied from May 21 to 31 (Table 9). Current recommendations for controlling Rhizoctonia are to apply labeled fungicides to sugarbeet either in-furrow at planting or in a 7 inch band prior to infection (prior to soil temperatures reaching 62^{o}F at the 4 inch depth because infection takes place $\geq$ 65 ^{o}F) or at both timings. Twenty-six percent of responses were for post emergence applications made after July 1 which is most likely too late to help control Rhizoctonia. Quadris was band applied to 78% of reported acres, while Headline and Proline were each broadcast to 100% of reported acres (Table 10).

An evaluation of seed treatments at controlling root diseases was conducted (Table 11). Sixty-five percent of respondents indicated good to excellent control from Tachigaren for controlling Aphanomyces, while 46% of respondents indicated good to excellent control from Metlock or NipsIT for controlling Rhizoctonia. No respondents reported planting seeds treated with Dynasty in 2012.

Table 1. Fungicide use for Cercospora control by survey respondents in 2012.

			Super/		Triazoles			Strobylurins		Tank-mixes					Total
County	Respondent acres planted	Not treated	Agri Tin	Topsin	Proline	Emi-nent	Inspire XT	Head-line	Gem	Tin+ Topsin	Tin+ Triazole	EBDC+ Triazole	Un-known	Other[7]	acres treated
		% of acres planted													
Cass	1,323	0	0	0	0	0	0	97	0	39	100	0	0	0	236
Chippewa[1]	1,973	0	266	0	15	0	0	15	15	0	0	79	6	79	476
Clay[2]	7,147	1	65	0	54	0	40	92	0	32	6	0	0	4	294
Grand Forks	2,446	55	12	0	0	0	28	43	0	57	8	9	0	0	212
Kittson	5,436	20	31	0	48	0	32	78	0	0	17	0	0	0	227
Marshall	5,200	43	19	0	57	0	0	52	0	15	21	0	0	0	207
Norman[3]	3,775	7	66	0	0	0	93	77	0	93	0	0	0	0	336
Pembina	5,153	4	12	6	75	0	27	92	0	3	8	0	0	0	228
Polk	16,660	0	10	13	51	3	13	85	0	75	1	0	13	16	281
Renville[4]	6,323	8	180	0	48	26	0	43	54	0	0	27	0	12	398
Richland	368	0	0	0	0	0	100	90	0	100	0	0	0	0	290
Traill	896	7	27	0	25	0	27	93	0	25	40	0	0	0	245
Traverse[5]	2,241	0	109	0	15	19	65	70	5	0	0	0	0	10	294
Walsh	2,602	0	32	11	9	14	23	54	0	0	11	0	43	0	196
Wilkin[6]	8,119	25	36	4	29	0	5	54	8	48	0	23	15	0	247
Total	69,662	11	51	4	41	4	22	71	6	37	7	8	7	8	277

[1]Includes Kandiyohi and Swift Counties
[2]Includes Becker County
[3]Includes Mahnomen County
[4]Includes Faribault, Lac Qui Parle, McLeod, Redwood, Sibley, Stearns, and Yellow Medicine Counties
[5]Inclueds Big Stone, Grant, Pope, and Stevens Counties
[6]Includes Ottertail County
[7]Other includes: Triazole+Triazole; EBDC+Strobilurin; Tin+Strobilurin; EBDC; Tin+EBDC

Table 2. Number of fungicide applications by survey respondents in 2012.

County	Respondents	Number of Applications						
		0[7]	1	2	3	4	5	6
		% of respondents						
Cass	3	0	0	67	33	0	0	0
Chippewa[1]	4	25	0	0	0	50	25	0
Clay[2]	8	13	0	0	88	0	0	0
Grand Forks	6	33	0	0	50	17	0	0
Kittson	7	14	0	43	43	0	0	0
Marshall	6	17	0	17	67	0	0	0
Norman[3]	3	33	0	0	33	33	0	0
Pembina	9	11	0	44	44	0	0	0
Polk	27	11	4	7	63	15	0	0
Renville[4]	12	8	0	8	17	25	33	8
Richland	1	0	0	0	100	0	0	0
Traill	4	25	0	25	50	0	0	0
Traverse[5]	4	0	0	25	50	0	0	25
Walsh	6	33	0	17	50	0	0	0
Wilkin[6]	14	29	0	14	14	43	0	0
Total	114	17	1	16	46	15	4	2

[1]Includes Kandiyohi and Swift Counties
[2]Includes Becker County
[3]Includes Mahnomen County
[4]Includes Faribault, Lac Qui Parle, McLeod, Redwood, Sibley, Stearns, and Yellow Medicine Counties
[5]Inclueds Big Stone, Grant, Pope, and Stevens Counties
[6]Includes Ottertail County
[7]Includes no responses

Table 3. Ground and aerial application of fungicides in 2012.

County	Treated Acres	Ground	Aerial
		% of treated acres	
Cass	3,122	100	0
Chippewa[1]	9,385	99	0
Clay[2]	20,941	98	2
Grand Forks	3,847	84	16
Kittson	11,230	100	0
Marshall	8,558	98	2
Norman[3]	12,433	100	0
Pembina	11,526	80	20
Polk	46,753	60	37
Renville[4]	24,646	93	7
Richland	1,066	100	0
Traill	2,130	17	83
Traverse[5]	6,578	100	0
Walsh	5,108	62	16
Wilkin[6]	18,068	69	24
Total	185,391	82	16

[1]Includes Kandiyohi and Swift Counties
[2]Includes Becker County
[3]Includes Mahnomen County
[4]Includes Faribault, Lac Qui Parle, McLeod, Redwood, Sibley, Stearns, and Yellow Medicine Counties
[5]Inclueds Big Stone, Grant, Pope, and Stevens Counties
[6]Includes Ottertail County

Table 4. Date of first fungicide application for CLS in 2012.

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	3	-	-	-	67	33	-
Chippewa[1]	3	67	33	-	-	-	-
Clay[2]	7	-	-	57	43	-	-
Grand Forks	4	25	25	25	25	-	-
Kittson	6	-	17	-	33	50	-
Marshall	5	-	40	20	40	-	-
Norman[3]	2	-	-	100	-	-	-
Pembina	8	-	-	38	25	25	13
Polk	25	4	4	32	48	12	-
Renville[4]	11	73	27	-	-	-	-
Richland	1	-	-	100	-	-	-
Traill	3	-	-	-	100	-	-
Traverse[5]	4	50	50	-	-	-	-
Walsh	4	-	25	75	-	-	-
Wilkin[6]	10	20	30	50	-	-	-
Total	96	17	16	29	28	9	1

[1]Includes Kandiyohi and Swift Counties
[2]Includes Becker County
[3]Includes Mahnomen County
[4]Includes Faribault, Lac Qui Parle, McLeod, Redwood, Sibley, Stearns, and Yellow Medicine Counties
[5]Inclueds Big Stone, Grant, Pope, and Stevens Counties
[6]Includes Ottertail County

Table 5. Date of last fungicide application for CLS in 2012.

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	3	-	-	-	100	-	-
Chippewa[1]	3	-	-	-	67	-	33
Clay[2]	7	-	-	-	86	14	-
Grand Forks	4	-	25	-	25	50	-
Kittson	6	-	-	-	67	33	-
Marshall	5	-	-	-	40	40	20
Norman[3]	2	-	-	-	100	-	-
Pembina	8	-	-	-	38	63	-
Polk	25	-	-	4	60	36	-
Renville[4]	11	-	18	18	27	36	-
Richland	1	-	-	-	100	-	-
Traill	3	-	-	-	67	33	-
Traverse[5]	4	25	-	25	25	25	-
Walsh	4	-	-	-	100	-	-
Wilkin[6]	10	-	20	20	40	20	-
Total	96	1	5	6	55	30	2

[1]Includes Kandiyohi and Swift Counties
[2]Includes Becker County
[3]Includes Mahnomen County
[4]Includes Faribault, Lac Qui Parle, McLeod, Redwood, Sibley, Stearns, and Yellow Medicine Counties
[5]Inclueds Big Stone, Grant, Pope, and Stevens Counties
[6]Includes Ottertail County

Table 6. Fungicide control of Cercospora leafspot in 2012.

Fungicide	Number of Responses	Excellent	Good	Fair	Poor	Unsure
		----------% of responses----------				
Super Tin/Agri Tin	57	39	46	9	-	7
Topsin	10	67	-	33	-	-
Proline	39	49	41	5	-	5
Eminent	8	50	25	25	-	-
Inspire XT	23	48	39	13	-	-
Headline	85	46	42	9	-	2
Gem	8	50	25	-	-	25
Tin+Topsin	40	50	40	10	-	-
Tin+Triazole	13	85	15	-	-	-
EBDC+Triazole	11	55	36	-	-	9
Other[1]	12	-	75	-	8	17
Total	302	46	40	9	<1	4

[1]Other includes Triazole+Triazole; EBDC+Strobilurin; Tin+Strobilurin; EBDC; Tin+EBDC

Table 7. Acres reported as damaged by Aphanomyces, Rhizoctonia, Fusarium, and Rhizomania in 2012.

County	Respondent acres planted	Acres reported as damaged by Aphanomyces	Acres reported as damaged by Rhizoctonia	Acres reported as damaged by Fusarium	Acres reported as damaged by Rhizomania
		----------% of acres planted----------			
Cass	1,323	0	15	0	0
Chippewa[1]	1,973	25	20	0	10
Clay[2]	7,147	3	8	4	0
Grand Forks	2,446	0	17	0	2
Kittson	5,436	4	36	0	0
Marshall	5,200	3	24	0	2
Norman[3]	3,775	0	48	0	0
Pembina	5,153	0	18	0	0
Polk	16,660	7	31	1	3
Renville[4]	6,323	5	3	0	2
Richland	368	0	5	0	0
Traill	896	0	33	0	0
Traverse[5]	2,241	0	2	0	0
Walsh	2,602	0	23	0	0
Wilkin[6]	8,119	1	5	0	0
Total	69,662	4	21	1	1

[1]Includes Kandiyohi and Swift Counties
[2]Includes Becker County
[3]Includes Mahnomen County
[4]Includes Faribault, Lac Qui Parle, McLeod, Redwood, Sibley, Stearns, and Yellow Medicine Counties
[5]Inclueds Big Stone, Grant, Pope, and Stevens Counties
[6]Includes Ottertail County

Table 8. Evaluation of fungicides for Rhizoctonia control and crop injury in 2012.

Application Method / Fungicide	Acres Treated	Responses	Crop Injury					Rhizoctonia Control				
			None	Slight	Mod	Sev	Unsure	Exc	Good	Fair	Poor	Unsure
			----------% of responses----------					----------% of responses----------				
In-Furrow												
Quadris	410	2	100	-	-	-	-	-	100	-	-	-
Quadris+Starter	3,669	4	-	75	-	-	25	-	75	25	-	-
Headline	0	0	-	-	-	-	-	-	-	-	-	-
Headline+Starter	8,984	19	79	16	5	-	-	5	42	42	-	11
Foliar												
Quadris	35,512	61	90	6	-	-	3	13	42	26	3	16
Headline	2,183	8	87	13	-	-	-	13	25	38	-	25
Proline	14,702	22	95	-	5	-	-	14	36	14	18	18
Total	65,460	116	86	9	2	0	3	11	42	27	5	15

Table 9. Date of POST fungicide application for Rhizoctonia control in sugarbeet in 2012

Fungicide	No. of Responses	Before May 1	May 1-10	May 11-20	May 21-31	June 1-10	June 11-20	June 21-30	July 1 or after
		----------% of responses----------							
Quadris	65	9	17	26	29	11	5	3	0
Headline	8	0	0	0	13	0	0	0	88
Proline	22	0	0	0	0	0	9	9	82
Total	95	6	12	18	21	7	5	4	26

Table 10. Method of application of POST fungicides applied for Rhizoctonia control in sugarbeet in 2012.

Fungicide	Acres Treated	Band	Broadcast	Airplane
		----------% of acres treated----------		
Quadris	35,512	72	27	1
Headline	2,183	0	87	13
Proline	14,702	0	88	12
Total	52,397	49	47	4

Table 11. Evaluation of seed treatments at controlling root diseases in sugarbeet in 2012.

Seed Treatment	Acres Treated	Responses	Excellent	Good	Fair	Poor	Unsure
			----------% of responses----------				
20 g Tachigaren[1]	8,486	23	17	43	13	0	26
45 g Tachigaren	14,241	32	13	56	9	0	22
Dynasty	0	0	0	0	0	0	0
Metlock	3,314	15	7	33	33	7	20
NipsIT	3,061	11	0	55	0	0	45
Total	29,102	81	11	48	14	1	26

[1]Tachigaren was evaluated for Aphanomyces control while Dynasty, Metlock, and NipsIT were evaluated for Rhizoctonia control.