SURVEY OF FUNGICIDE USE IN SUGARBEET IN MINNESOTA AND EASTERN NORTH DAKOTA IN 2015

Peter C. Hakk[1], Andrew B. Lueck[1], Thomas J. Peters[2], Mohamed F.R. Khan[2], and Mark A. Boetel[3]

[1]Sugarbeet Research Specialists and [2]Extension Sugarbeet Specialists
North Dakota State University - University of Minnesota, Fargo, ND
and
[3]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 2015, averaged over all counties, was 296% of respondent acres as compared to179% in 2014, 218% in 2013, 277% in 2012, 259% in 2011, 225% in 2010, 156% in 2009, 222% in 2008, 242% in 2007 and 208% in 2006 (Table 1). Acres not treated with fungicide were 0% of respondents in 2015 as compared to 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 Renville County in 2015 with 442% of respondent acres receiving fungicides for control of CLS. The greatest fungicide use in 2014 was in Renville County in 2014 with 283% of respondent acres receiving fungicides for control of CLS. The greatest fungicide use 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%, 2006 in Renville County with 335% and in 1998 in Chippewa County with 852%. Super/Agri Tin, Headline, Proline, Tin + Topsin and Inspire XT were the most commonly used fungicides in 2015 and were used on 66%, 51%, 40%, 36% and 30% of the acres respectively.

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, 7% in 2012, <1% in 2013 and 0% in 2014 before rising back to 12% in 2015. Triazoles, either by themselves or in tank-mixtures, were applied to 95% of respondent acres in 2015, compared to 69% of respondent acres in 2014, 58% in 2013, in 2012, 97% in 2011, and 88% in 2010. Headline was used on 51% of the sugarbeet acreage 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. Strobilurin fungicides (Headline, Gem and Priaxor) were applied either alone or in tank mixtures to 88% of acres 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 one to six times per respondent in 2015 (Table 2). The average number of applications per acre was 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, 2.6 in 2002 and 2.5 in 2001.

Averaged over fungicides and counties, 95% of treated acres were sprayed with a ground sprayer while 5% were treated with an aerial sprayer in 2015 (Table 3). The usage of ground sprayers ranged from 75% in Pembina County to 100% in Cass, Clay, Grand Forks, Kittson, Marshall, Norman, Richland and Walsh Counties. The overall usage of ground sprayers was 86% in 2014, 85% in 2013, 82% in 2012, 78% in 2011 and 2010, 86% in 2009, 77% in 2008, 2007, and 2006.

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 2014, while 4% of respondents in 2014, 10% in 2013, 12% in 2011, 2010, and 2009, 5% in 2008, 22% in 2007 and 12% in 2006 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 88% of the respondents and after August 31 by 52% of the respondents. The last fungicide application was before August 11 by 2% of the respondents.

Cercospora leaf spot control was evaluated as excellent or good by 85% of the survey respondents averaged over all fungicides (Table 6). Three percent of responses indicated a poor level of CLS control.

Fungicides were evaluated for Rhizoctonia control in 2015 (Table 7). Twenty six post emergence responses were reported. Quadris was applied in 85% of responses while Proline was applied on 8% of responses while Headline and Priaxor were applied on 4% of responses. Respondents indicated they received excellent control of Rhizoctonia with post emergence fungicide 4% of the time, good control 73% of the time and a fair amount of control 12% of the time. Forty six percent of responses indicated a post emergence fungicide applied from June 1 to 15 (Table 8). 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.

An evaluation of satisfaction of seed treatments was conducted (Table 9). One hundred percent of respondents said they were satisfied or very satisfied with Metlock + Rizolex + Kabina, 95% said they were satisfied or very satisfied with their Tachigaren use and 96% also respondended being satisfied or very satisfied with Kabina and 100% were satisfied or very satisfied with Metlock + Rizolex in 2014. Four percent of respondents in 2015 reported being unsatisfied with Kabina while 5% were unsatisfied with Tachigaren.

Lime rates were evaluated for satisfaction in 2015 (Table 10). One hundred percent of respondents said they were either satisfied or very satisfied with spreading the low rate (<5 Ton/A) of lime while 100% were also either very satisfied or satisfied with spreading the high rate (10+ Ton/A) of lime. Ninety six percent of respondents were either satisfied or very satisfied with spread the mid rate (5-10 Ton/A) of lime.

Table 1. Fungicide use for Cercospora control by survey respondents in 2015.

	Respondent		Super/		Triazoles			Strobilurins			Tank-mixes				Total
County	acres planted[6]	Not treated	Agri Tin	Top-sin	Pro-line	Emi-nent	Inspire XT	Head-line	Gem	Pri-axor	Tin+ Topsin	Tin+ Triazl	EBDC+ Triazl	Other[7]	acres treated
								% of acres planted							
Cass	980	-	-	-	96	-	-	38	-	58	96	-	-	-	288
Chippewa[1]	7,145	-	155	-	44	54	10	15	17	62	1	-	-	2	359
Clay[2]	3,148	-	41	-	16	22	44	73	-	3	20	-	-	-	219
Grand Forks	5,153	-	69	-	92	-	8	62	-	23	29	-	-	-	282
Kittson	1,820	-	-	-	49	-	-	12	-	38	8	-	-	-	107
Marshall	1,425	-	-	-	100	-	-	100	-	-	-	-	-	-	200
Norman	2,991	-	-	-	-	16	84	88	-	-	100	14	-	-	302
Pembina	2,159	-	-	-	-	-	31	27	-	66	-	-	-	-	125
Polk[3]	5,534	-	11	12	29	-	62	56	-	30	32	-	8	-	239
Renville[4]	6,601	-	150	-	90	30	6	23	68	31	20	-	-	23	442
Richland	6,095	-	48	-	-	23	38	78	-	20	87	-	-	36	330
Traverse[5]	4,605	-	48	30	11	30	56	54	-	-	52	-	-	11	291
Walsh	1,985	-	53	-	30	26	17	26	-	17	26	-	-	-	196
Wilkin	3,100	-	78	5	18	65	35	82	-	-	44	-	-	-	326
Total	52,741	-	66	4	40	23	30	51	11	26	36	1	1	8	296

[1]Includes Kandiyohi and Pope Counties
[2]Includes Becker County
[3]Includes Pennington County
[5]Includes Redwood and Yellow Medicine Counties
[5]Includes Grant County
[6]Respondent acres planted does not include acres by respondents who skipped the cercospora questions on the survey.
[7]Other includes: Topguard, Strobilurin + Strobilurin, EBDC + TPTH, Triazole + Triazole, Triazole + Strobilurin.

Table 2. Number of fungicide applications by survey respondents in 2015.

County	Respondents	Number of Applications per Respondent						
		0	1	2	3	4	5+	NR[6]
		----------% of respondents----------						
Cass	2	-	-	-	100	-	-	-
Chippewa[1]	10	-	-	10	30	30	30	-
Clay[2]	5	-	-	20	80	-	-	-
Grand Forks	4	-	-	25	50	25	-	-
Kittson	2	-	-	100	-	-	-	-
Marshall	2	-	-	100	-	-	-	-
Norman	2	-	-	-	50	50	-	-
Pembina	3	-	67	33	-	-	-	-
Polk[3]	10	-	-	30	70	-	-	-
Renville[4]	11	-	-	-	-	55	45	-
Richland	5	-	-	-	40	60	-	-
Traverse[5]	5	-	-	-	60	40	-	-
Walsh	4	-	-	75	25	-	-	-
Wilkin	8	-	-	13	50	38	-	-
Total	73	-	3	21	40	26	11	-

[1]Includes Kandiyohi and Pope Counties
[2]Includes Becker County
[3]Includes Pennington County
[5]Includes Redwood and Yellow Medicine Counties
[5]Includes Grant County
[6]NR=no response

Table 3. Ground and aerial application of fungicides in 2015.

County	Treated Acres	Ground	Aerial
		----------% of treated acres----------	
Cass	2,820	100	-
Chippewa[1]	25,789	95	5
Clay[2]	6,895	100	-
Grand Forks	14,516	100	-
Kittson	1,944	100	-
Marshall	2,850	100	-
Norman	9,030	100	-
Pembina	2,694	75	25
Polk[3]	13,212	76	24
Renville[4]	28,108	93	7
Richland	20,903	100	-
Traverse[5]	14,710	97	3
Walsh	4,495	100	-
Wilkin	10,380	95	5
Total	158,346	95	5

[1]Includes Kandiyohi and Pope Counties
[2]Includes Becker County
[3]Includes Pennington County
[5]Includes Redwood and Yellow Medicine Counties
[5]Includes Grant County

Table 4. Date of first fungicide application for CLS in 2015.

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	-	-	-	100	-	-
Chippewa[1]	10	30	60	10	-	-	-
Clay[2]	5	-	-	40	60	-	-
Grand Forks	4	-	-	25	75	-	-
Kittson	2	-	-	-	50	50	-
Marshall	2	-	-	-	-	100	-
Norman	2	-	-	-	100	-	-
Pembina	3	-	-	-	33	-	67
Polk[3]	10	-	-	10	40	40	10
Renville[4]	11	55	36	9	-	-	-
Richland	5	-	20	80	-	-	-
Traverse[5]	5	-	20	80	-	-	-
Walsh	4	-	-	25	75	-	-
Wilkin	8	13	25	38	25	-	-
Total	73	14	19	25	29	10	4

[1]Includes Kandiyohi and Pope Counties
[2]Includes Becker County
[3]Includes Pennington County
[5]Includes Redwood and Yellow Medicine Counties
[5]Includes Grant County

Table 5. Date of last fungicide application for CLS in 2015.

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	-	-	-	50	50	-
Chippewa[1]	10	10	-	20	20	50	-
Clay[2]	5	-	-	-	80	20	-
Grand Forks	4	-	-	-	50	50	-
Kittson	2	-	-	50	-	50	-
Marshall	2	-	-	-	50	50	-
Norman	2	-	-	-	-	100	-
Pembina	3	-	-	-	67	33	-
Polk[3]	10	-	-	-	40	60	-
Renville[4]	11	-	-	9	27	36	27
Richland	5	-	-	-	20	60	20
Traverse[5]	4	-	-	25	50	25	-
Walsh	4	-	25	25	25	25	-
Wilkin[8]	8	-	-	13	38	50	-
Total	72	1	1	10	36	46	6

[1]Includes Kandiyohi and Pope Counties
[2]Includes Becker County
[3]Includes Pennington County
[4]Includes Redwood and Yellow Medicine Counties
[5]Includes Grant County

Table 6. Fungicide control of Cercospora leafspot in 2015.

Fungicide	Number of Responses	Excellent	Good	Fair	Poor	Unsure
		----------% of responses----------				
Super Tin/Agri Tin	53	30	51	15	4	-
Topsin	3	-	100	-	-	-
Proline	32	41	41	16	3	-
Eminent	16	44	56	-	-	-
Inspire XT	24	33	63	4	-	-
Headline	40	40	40	15	5	-
Priaxor	19	32	58	11	-	-
Gem	10	10	70	20	-	-
Tin+Topsin	30	40	40	13	7	-
Tin+Triazole	1	-	100	-	-	-
Tin+Headline	1	-	100	-	-	-
Other[1]	7	57	29	14	-	-
Total	236	35	50	12	3	-

[1]Other includes Topguard, Strobilurin + Strobilurin, EBDC + TPTH, Triazole + Triazole, Triazole + Strobilurin

Table 7. Evaluation of fungicides for Rhizoctonia control and crop injury in 2015.

Application Method / Fungicide	Acres Treated	Responses	Rhizoctonia Control				
			Exc	Good	Fair	Poor	Unsure
Foliar			----------% of responses----------				
Quadris	10,046	22	5	77	9	0	9
Proline	2,500	2	0	50	50	0	0
Headline	160	1	0	0	0	0	100
Priaxor	311	1	0	100	0	0	0
Total	10,046	26	4	73	12	0	12

Table 8. Date of POST fungicide application for Rhizoctonia control in sugarbeet in 2015.

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	22	0	18	27	50	5	0
Proline	2	0	0	0	0	50	50
Headline	1	0	0	0	100	0	0
Priaxor	1	0	0	100	0	0	0
Total	26	0	15	27	46	8	4

Table 9. Rating of seed treatment performance in sugarbeet in 2015.

Seed Treatment	Acres Treated	Responses	Very Satisfied	Satisfied	Unsatisfied	No Response
			----------% of responses----------			
Kabina	34,415	56	23	73	4	-
Metlock+Rizolex	2,598	7	43	57	-	-
Metlock+Rizolex+Kabina	5,833	14	29	71	-	-
Tachigaren	19,518	42	31	64	5	-
Total	62,364	119	28	69	3	-

Table 10. Use of Lime for controlling Aphanomyces

Lime Rate	Responses	Very Satisfied	Satisfied	Unsatisfied	No Response
			----------% of responses----------		
<5 Ton/A	12	17	83	-	-
5-10 Ton/a	25	44	52	4	-
10+ Ton/A	1	0	100	-	-
Total	38	34	63	3	-