# SURVEY OF FUNGICIDE USE IN SUGARBEET IN MINNESOTA AND EASTERN NORTH DAKOTA IN 2013

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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 2013, averaged over all counties, was 218% of respondent acres as compared to 277% in 2012, 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 4% in 2013, compared to 11% in 2012, 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 2013 with 352% of respondent acres receiving fungicide for control of CLS. The greatest fungicide use in 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%, 2005 in Renville County with 304%, and in 1998 in Chippewa County with 852%. Headline, Tin+Topsin, Super/Agri Tin, and Proline were the most commonly used fungicides in 2013 and were used on 70%, 35%, 25% and 24% of the acres, respectively.

From a historical perspective, Eminent and Headline use has had a large impact on Cercospora control in Minnesota and eastern North Dakota. 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, and <1% in 2013. While Eminent usage has declined the past few years, the introduction of two new triazole fungicides in the mid to late 2000s, Proline and Inspire XT, has resulted in consistent usage of triazole fungicides for CLS control. Triazoles, either by themselves or in tank-mixtures, were applied to 58% of respondent acres in 2013, compared to 82% in 2012, 97% in 2011, and 88% in 2010. Headline was used on 70% of the sugarbeet acreage 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 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 78% of acres in 2013, 77% in 2012, 91% in 2011, and 89% in 2010.

The number of fungicide applications varied from zero to five times per respondent in 2013 (Table 2). The average number of applications per acre was 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, 85% of treated acres were sprayed with a ground sprayer while 15% were treated with an aerial sprayer in 2013 (Table 3). The usage of ground sprayers ranged from 45% in Traill County to 100% in several counties. The overall usage of ground sprayers was 82% in 2012, 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 July 1 to after August 10 (Table 4). Southern areas generally were sprayed earlier than northern areas. Ten percent of respondents began spraying prior to July 11 in 2013, while 33% of respondents in 2012, 12% in 2011, 2010, and 2009, 5% in 2008, 22% in 2007, and 12% in 2006 and 2005, 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 80% of the respondents and after August 31 by 30% of the respondents. The last fungicide application was before August 11 by 4% of the respondents.

Cercospora leaf spot control was evaluated as excellent or good by 95% of the survey respondents averaged over all fungicides (Table 6). Three 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 2013 are 4% damaged by Aphanomyces, 11% damaged by Rhizoctonia, 2% damaged by Fusarium, and 3% damaged by Rhizomania (Table 7). Thirty percent of survey respondents reported Rhizoctonia/Aphanomyces as their number one production problem in 2013. 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 2013 (Table 8). Thirty-five responses were reported for in-furrow fungicide applications. Headline was applied in-furrow in 60% of responses, while Quadris was applied in-furrow in 40%. One-hundred twelve post emergence responses were reported. Quadris was applied in 79% of responses while Proline and Headline were applied in 13% and 8% respectively.

Thirty-five percent of responses indicated a post emergence fungicide applied from June 1 to 10 (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. Fifteen 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 80% 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-three percent of respondents indicated good to excellent Aphanomyces control from Tachigaren at a rate of 20g per unit compared to 88% good to excellent from Tachigaren at 40 g per unit. Sixty percent of respondents indicated good to excellent control from Metlock or NipsIt Suite for controlling Rhizoctonia. Only one respondent reported planting seeds treated with Dynasty in 2013.

**Table 1. Fungicide use for Cercospora control by survey respondents in 2013.**

| County | Respondent acres planted[5] | Not treated | Super/ Agri Tin | Top-sin | Triazoles: Pro-line | Triazoles: Emi-nent | Triazoles: Inspire XT | Strobilurins: Head-line | Strobilurins: Gem | Tank-mixes: Tin+ Topsin | Tank-mixes: Tin+ Triazl | Tank-mixes: EBDC+ Triazl | Tank-mixes: EBDC +Stroby | Other[6] | Total acres treated |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % of acres planted | | | | | | | | | | | | | |
| Cass | 1,307 | 26 | - | - | - | - | - | 66 | - | - | 74 | - | - | - | 140 |
| Chippewa[1] | 3,344 | - | 67 | - | - | 3 | - | 12 | - | 49 | - | 58 | 52 | 110 | 352 |
| Clay | 9,077 | 1 | 47 | - | 10 | - | 8 | 85 | - | 11 | 8 | - | - | 8 | 177 |
| Grand Forks | 6,238 | - | 44 | - | 29 | 3 | 21 | 95 | - | 49 | 47 | - | - | - | 287 |
| Kittson | 1,580 | - | - | - | 89 | - | - | 105 | - | - | - | - | - | - | 193 |
| Marshall | 4,307 | - | - | 22 | 55 | 14 | - | 86 | - | 41 | 14 | - | - | - | 232 |
| Norman | 8,620 | - | 23 | 37 | 5 | - | 54 | 62 | - | 19 | 5 | - | - | 28 | 234 |
| Pembina | 8,356 | 19 | 2 | - | 10 | - | 5 | 48 | - | 4 | - | - | - | 30 | 98 |
| Polk | 25,491 | 1 | 12 | 6 | 40 | 4 | 14 | 79 | - | 42 | 16 | - | - | 19 | 232 |
| Renville[2] | 6,570 | - | 86 | - | 57 | 5 | - | 8 | 55 | 61 | - | 38 | 38 | - | 347 |
| Richland[3] | 3,728 | 12 | - | - | - | - | - | 102 | - | 88 | 24 | - | - | - | 214 |
| Traill | 3,118 | - | - | - | - | - | 93 | 93 | - | - | 7 | - | - | - | 193 |
| Traverse[4] | 4,061 | 3 | 39 | 8 | 9 | 5 | 5 | 92 | - | 77 | - | - | - | - | 235 |
| Walsh | 6,126 | - | 29 | - | 33 | 11 | 7 | 89 | - | - | 8 | - | - | - | 177 |
| Wilkin | 8,307 | 18 | 23 | 5 | - | - | 10 | 52 | - | 51 | - | 3 | - | 20 | 164 |
| Total | 100,230 | 4 | 25 | 6 | 24 | 3 | 15 | 70 | 4 | 35 | 11 | 5 | 4 | 16 | 218 |

[1]Includes Kandiyohi and Swift Counties
[2]Includes Redwood County
[3]Includes Ransom County
[4]Includes Big Stone, Grant, and Stevens Counties
[5]Respondent acres planted does not include acres by respondents who skipped the cercospora questions on the survey.
[6]Other includes: Headline+Tin; Headline+Topguard; Headline+Tin+EBDC; Inspire+Topsin; Proline+Eminent; Priaxor; Other

**Table 2. Number of fungicide applications by survey respondents in 2013.**

| County | Respondents | Number of Applications per Respondent | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | NR[5] |
| | | ----------% of respondents---------- | | | | | | |
| Cass | 4 | - | - | 50 | 25 | - | - | 25 |
| Chippewa[1] | 6 | - | - | - | 50 | 50 | - | - |
| Clay | 12 | 8 | 17 | 58 | - | - | - | 17 |
| Grand Forks | 9 | - | - | 22 | 67 | - | - | 11 |
| Kittson | 5 | - | 20 | 80 | - | - | - | - |
| Marshall | 7 | - | 14 | 29 | 43 | - | - | 14 |
| Norman | 9 | - | 22 | - | 56 | 11 | - | 11 |
| Pembina | 11 | 9 | 46 | 36 | - | - | - | 9 |
| Polk | 41 | 2 | 7 | 27 | 63 | - | - | - |
| Renville[2] | 11 | - | - | - | 36 | 36 | 9 | 18 |
| Richland[3] | 9 | 11 | - | 56 | - | 11 | - | 22 |
| Traill | 8 | - | 12 | 63 | - | - | - | 25 |
| Traverse[4] | 12 | 8 | - | 25 | 33 | 8 | - | 25 |
| Walsh | 18 | - | 17 | 72 | - | - | - | 11 |
| Wilkin | 21 | 5 | 14 | 52 | 14 | - | - | 14 |
| Total | 183 | 3 | 12 | 38 | 30 | 6 | <1 | 11 |

[1]Includes Kandiyohi and Swift Counties
[2]Includes Redwood County
[3]Includes Ransom County
[4]Includes Big Stone, Grant, and Stevens Counties
[5]NR=no response

**Table 3. Ground and aerial application of fungicides in 2013.**

| County | Treated Acres | Ground | Aerial |
|---|---|---|---|
| | | ----------% of treated acres---------- | |
| Cass | 1,836 | 100 | <1 |
| Chippewa[1] | 11,772 | 100 | 0 |
| Clay | 16,047 | 90 | 10 |
| Grand Forks | 17,924 | 89 | 11 |
| Kittson | 3,052 | 68 | 32 |
| Marshall | 10,000 | 100 | 0 |
| Norman | 20,142 | 77 | 23 |
| Pembina | 8,230 | 99 | 1 |
| Polk | 59,402 | 76 | 24 |
| Renville[2] | 22,811 | 99 | 1 |
| Richland[3] | 7,980 | 100 | 0 |
| Traill | 6,018 | 45 | 55 |
| Traverse[4] | 9,551 | 82 | 18 |
| Walsh | 10,837 | 92 | 8 |
| Wilkin | 13,611 | 81 | 19 |
| Total | 219,213 | 85 | 15 |

[1]Includes Kandiyohi and Swift Counties
[2]Includes Redwood County
[3]Includes Ransom County
[4]Includes Big Stone, Grant, and Stevens Counties

**Table 4. Date of first fungicide application for CLS in 2013.**

| 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 | - | - | - | 33 | 33 | 33 |
| Chippewa[1] | 6 | - | 17 | 67 | 17 | - | - |
| Clay | 8 | - | - | 13 | 50 | 13 | 25 |
| Grand Forks | 8 | - | - | 13 | 88 | - | - |
| Kittson | 5 | - | - | - | - | 80 | 20 |
| Marshall | 6 | - | - | - | 67 | 17 | 17 |
| Norman | 6 | - | - | 33 | 67 | - | - |
| Pembina | 8 | - | - | - | 13 | 25 | 63 |
| Polk | 38 | - | - | 3 | 58 | 26 | 13 |
| Renville[2] | 9 | - | 78 | 22 | - | - | - |
| Richland[3] | 5 | - | - | 20 | 60 | - | 20 |
| Traill | 6 | - | - | - | 50 | 50 | - |
| Traverse[4] | 7 | - | 43 | 29 | 29 | - | - |
| Walsh | 16 | - | 13 | - | 19 | 25 | 44 |
| Wilkin | 14 | - | 7 | 29 | 57 | 7 | - |
| Total | 145 | 0 | 10 | 12 | 43 | 19 | 16 |

[1]Includes Kandiyohi and Swift Counties
[2]Includes Redwood County
[3]Includes Ransom County
[4]Includes Big Stone, Grant, and Stevens Counties

**Table 5. Date of last fungicide application for CLS in 2013.**

| 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 | - | - | - | 67 | 33 | - |
| Chippewa[1] | 6 | - | - | 17 | 83 | - | - |
| Clay | 8 | - | - | 13 | 75 | 13 | - |
| Grand Forks | 8 | - | - | 13 | 50 | 25 | 13 |
| Kittson | 5 | - | - | 20 | 40 | 40 | - |
| Marshall | 6 | - | - | - | 33 | 67 | - |
| Norman | 6 | - | - | - | 50 | 50 | - |
| Pembina | 8 | - | - | 25 | 50 | 25 | - |
| Polk | 37 | - | - | 3 | 51 | 41 | 5 |
| Renville[2] | 9 | - | - | 22 | 44 | 33 | - |
| Richland[3] | 6 | - | - | 50 | 50 | - | - |
| Traill | 6 | - | - | - | 100 | - | - |
| Traverse[4] | 8 | 13 | 13 | 38 | 25 | 13 | - |
| Walsh | 16 | 6 | - | 6 | 50 | 31 | 6 |
| Wilkin | 14 | - | 29 | 50 | 21 | - | - |
| Total | 146 | 1 | 3 | 16 | 50 | 27 | 3 |

[1]Includes Kandiyohi and Swift Counties
[2]Includes Redwood County
[3]Includes Ransom County
[4]Includes Big Stone, Grant, and Stevens Counties

**Table 6. Fungicide control of Cercospora leafspot in 2013.**

| Fungicide | Number of Responses | Excellent | Good | Fair | Poor | Unsure |
|---|---|---|---|---|---|---|
| | | ----------% of responses---------- | | | | |
| Super Tin/Agri Tin | 48 | 69 | 25 | - | - | 6 |
| Topsin | 9 | 100 | - | - | - | - |
| Proline | 39 | 62 | 33 | - | - | 5 |
| Eminent | 9 | 56 | 44 | - | - | - |
| Inspire XT | 28 | 71 | 25 | - | - | 4 |
| Headline | 124 | 59 | 35 | 2 | - | 3 |
| Gem | 5 | 80 | - | - | - | 20 |
| Tin+Topsin | 59 | 66 | 31 | 2 | - | 2 |
| Tin+Triazole | 20 | 55 | 40 | 5 | - | - |
| EBDC+Triazole | 6 | 83 | 17 | - | - | - |
| EBDC+Strobylurin | 5 | 80 | 20 | - | - | - |
| Other[1] | 9 | 56 | 44 | - | - | - |
| Total | 361 | 64 | 31 | 1 | 0 | 3 |

[1]Other includes Headline+Tin; Headline+Topguard; Headline+Tin+EBDC; Inspire+Topsin; Proline+Eminent; Priaxor; Other

**Table 7. Acres reported as damaged by Aphanomyces, Rhizoctonia, Fusarium, and Rhizomania in 2013.**

| 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 | 1,557 | 5 | 8 | 5 | 5 |
| Chippewa[1] | 3,344 | 9 | 15 | - | 46 |
| Clay | 11,977 | 11 | 4 | 5 | 4 |
| Grand Forks | 11,998 | <1 | 14 | <1 | <1 |
| Kittson | 1,580 | - | 1 | - | - |
| Marshall | 4,468 | - | 21 | - | 4 |
| Norman | 8,840 | 4 | 21 | - | <1 |
| Pembina | 10,106 | 2 | 4 | <1 | 2 |
| Polk | 24,131 | 8 | 16 | 5 | 4 |
| Renville[2] | 6,986 | 1 | 14 | - | 1 |
| Richland[3] | 5,296 | <1 | 5 | - | 1 |
| Traill | 3,802 | <1 | 5 | - | - |
| Traverse[4] | 7,071 | 8 | 6 | - | <1 |
| Walsh | 8,682 | 2 | 5 | 3 | 1 |
| Wilkin | 9,664 | 3 | 12 | 1 | 1 |
| Total | 119,502 | 4 | 11 | 2 | 3 |

[1]Includes Kandiyohi and Swift Counties
[2]Includes Redwood County
[3]Includes Ransom County
[4]Includes Big Stone, Grant, and Stevens Counties

**Table 8. Evaluation of fungicides for Rhizoctonia control and crop injury in 2013.**

| Application Method / Fungicide | Acres Treated | Responses | Crop Injury | | | | | Rhizoctonia Control | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | None | Slight | Mod | Sev | Unsure | Exc | Good | Fair | Poor | Unsure |
| In-Furrow | | | ----------% of responses---------- | | | | | ----------% of responses---------- | | | | |
| Quadris | 5,051 | 7 | 71 | 29 | 0 | 0 | 0 | 29 | 71 | 0 | 0 | 0 |
| Quadris+Starter | 2,689 | 7 | 71 | 29 | 0 | 0 | 0 | 29 | 43 | 14 | 0 | 14 |
| Headline | 195 | 2 | 100 | 0 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 50 |
| Headline+Starter | 10,885 | 19 | 79 | 16 | 5 | 0 | 0 | 0 | 53 | 21 | 0 | 26 |
| Foliar | | | | | | | | | | | | |
| Quadris | 42,332 | 89 | 79 | 17 | 0 | 0 | 4 | 17 | 44 | 20 | 0 | 19 |
| Headline | 2,640 | 9 | 89 | 11 | 0 | 0 | 0 | 44 | 22 | 11 | 11 | 11 |
| Proline | 12,162 | 14 | 100 | 0 | 0 | 0 | 0 | 14 | 36 | 36 | 7 | 7 |
| Total | 75,954 | 147 | 81 | 16 | 1 | 0 | 3 | 17 | 44 | 20 | 1 | 18 |

**Table 9. Date of POST fungicide application for Rhizoctonia control in sugarbeet in 2013**

| 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 | 88 | 1 | 1 | 5 | 11 | 43 | 38 | 1 | 0 |
| Headline | 10 | 0 | 10 | 0 | 10 | 0 | 10 | 10 | 60 |
| Proline | 14 | 0 | 0 | 0 | 0 | 7 | 7 | 7 | 79 |
| Total | 112 | 1 | 2 | 4 | 10 | 35 | 31 | 3 | 15 |

**Table 10. Method of application of POST fungicides applied for Rhizoctonia control in sugarbeet in 2013.**

| Fungicide | Acres Treated | Band | Broadcast | Airplane |
|---|---|---|---|---|
| | | ----------% of acres treated---------- | | |
| Quadris | 42,332 | 80 | 20 | 0 |
| Headline | 2,640 | 0 | 100 | 0 |
| Proline | 12,162 | 0 | 97 | 3 |
| Total | 57,134 | 59 | 41 | <1 |

**Table 11. Evaluation of seed treatments at controlling root diseases in sugarbeet in 2013.**

| Seed Treatment | Acres Treated | Responses | Excellent | Good | Fair | Poor | Unsure |
|---|---|---|---|---|---|---|---|
| | | | ----------% of responses---------- | | | | |
| 20 g Tachigaren[1] | 13,642 | 43 | 26 | 37 | 7 | 5 | 26 |
| 45 g Tachigaren | 22,802 | 50 | 32 | 56 | 2 | 0 | 10 |
| Dynasty | 156 | 1 | 0 | 0 | 100 | 0 | 0 |
| Metlock | 13,794 | 40 | 10 | 58 | 5 | 5 | 23 |
| NipsIt Suite | 8,181 | 30 | 7 | 47 | 20 | 3 | 23 |
| Total | 58,575 | 164 | 20 | 49 | 8 | 3 | 20 |

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