SUGAR BEET (*Beta vulgaris* 'C-G333')
Cercospora Leaf Spot; *Cercospora beticola*

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Evaluation of foliar fungicides to manage Cercospora leaf spot of sugar beet in Michigan, 2019.

The trial was established at the Saginaw Valley Research and Extension Center in Frankenmuth, MI to evaluate the efficacy of experimental and commercially available fungicides for management of Cercospora leaf spot (CLS). A randomized complete block design was used, and treatments were replicated four times. Beets were planted 24 Apr at a rate of 50,000 seed/A, using 30-in row spacing. Plot dimensions were four rows wide by 45 ft long. Inoculations were made 9 Jul using a tractor mounted field sprayer, equipped with four TJ 2502E nozzles (30-in spacing), applying a *C. beticola* spore solution (100 spores/mL) at 15 gal/A. Fungicide programs were initiated late Jun, with biweekly applications until Sep. Six applications, A, B, C, D, E, and F, were made 26 Jun, 8 Jul, 22 Jul, 31 Jul, 14 Aug, and 23 Aug, respectively. Fungicides were applied with a CO_2 powered backpack sprayer equipped with four TJ 8004XR nozzles (30-in spacing), calibrated at 15 gal/A (23 PSI). A seventh application of copper (Badge SC, 1.5 pt/a) was made by farm staff 5 Sep to slow disease progression due to harvest being delayed. Plots were scouted regularly to monitor pest populations in the field, as well as to track CLS disease progression. Bi-weekly disease ratings were initiated 25 Jul (92 days after planting, DAP) and continued until 11 Sep (140 DAP). Plots were assigned a severity using the following scale based on infected leaf area: 1=0.1% (1-5 spots/leaf), 2=0.35% (6-12 spots/leaf), 3=0.75% (13-25 spots/leaf), 4=1.5% (26-50 spots/leaf), 5=2.5% (51-75 spots/leaf), 6=3%, 7=6%, 8=12% 9=25%, 10=50%. The ratings were used to calculate area under the disease progress curve for disease severity (AUDPC). The center two rows of the plots were harvested on 16 Sep to estimate yield in t/A. After weights were collected, subsamples from each plot were sent to Michigan Sugar Company (Bay City, MI) to determine percent sugar and recoverable white sugar per ton (RWST). A generalized linear mixed model procedure was used to conduct the ANOVA (α=0.05) and mean separations (SAS version 9.4).

CLS pressure was strong at this location, and differences were detected among treatments. AUDPC values were significantly different among treatments (P<0.0001). All programs, with the exception of 31, had significantly lower disease than program 1 (control). Programs 3, 4, 7, 8, and 10 resulted in the lowest AUDPC values and were not significantly different from each other. Significant differences were detected among mean yield values of the programs (P<0.0001). All programs except for 31 and 37 yielded significantly greater than the control, which had a mean yield of 13.6 t/A. Numerically, the highest yield was obtained by program 4 (23.3 t/A), which performed similarly to 12 other programs. Percent sugar and RWST differed significantly among programs (P<0.0001); in general, the range of values was comparable to commercially harvested sugar beets.

No.	Treatment, Rate[z], and Timing[y]	AUDPC[x, w]	Yield (t/A)	Sugar (%)	RWST[v]
8	Manzate Max (1.6 qt) ABCDEF + Proline (5.7 fl oz) B + Topsin (20 fl oz) B + Super Tin (8 fl oz) CE + Delaro (11 fl oz) D + Proline (1.71 fl oz) D + Propulse (13.6 fl oz) F	205.3 qr	20.5 b-j	18.2 b-f	260.1 a-c
10	Manzate Max (1.6 qt) ABCDEF + Delaro (11 fl oz) B + Proline (1.71 fl oz) B + Super Tin (8 fl oz) CE + Proline (5.7 fl oz) D + Topsin (20 fl oz) D + Flint Extra (3.6 fl oz) F	189.2 r	23.0 a-c	18.3 b-e	250.4 a-e
3	Exp[u] 1 (2 lb) ABCDEF	238.2 n-r	22.8 ab	18.9 bc	250.7 a-e
9	Manzate Max (1.6 qt) ABCDEF + Propulse (13.6 fl oz) B + Super Tin (8 fl oz) CE + Delaro (11 fl oz) D + Proline (1.71 fl oz) D + Topsin (20 fl oz) F + Proline (5.7 fl oz) F	283.5 k-p	22.4 a-e	19.2 b	255.1 a-e
4	Proline (5.1 fl oz) ABCDEF + Manzate Max (1.6 qt) ABCDEF	225.8 o-r	23.3 a	18.5 bd	277.4 a-d
7	Topsin (20 fl oz) A + Exp 1 (2 lb) AE + Dexter Max (2.1 lb) BD + Super Tin (8 fl oz) CF + Manzate Max (1.6 qt) CF	216.5 p-r	22.8 ab	18.4 b-d	248.3 a-e
35	Manzate Max (1.6 qt) ABDF + Exp 4 (7 fl oz) BD + Priaxor (8 fl oz) BF + Serifel (4 oz) CE + Super Tin (8 fl oz) CE + Topsin (20 fl oz) D	274.7 m-p	22.5 a-e	18.5 b-d	269.4 a-c
36	Manzate Max (1.6 qt) ABDF + Exp 4 (7 fl oz) BD + Priaxor (8 fl oz) BF + Super Tin (8 fl oz) CE + Topsin (20 fl oz) D	280.7 l-p	21.3 a-g	19.0 ab	256.8 a-e
2	Inspire XT (7 fl oz) AC + Manzate Max (1.6 qt) ABCDEF + Super Tin (8 fl oz) BD	290.1 i-o	21.2 a-g	19.0 ab	265.4 a-c
5	Super Tin (8 fl oz) ACE + Manzate Max (1.6 qt) ACE + Exp 1 (2 lb) BDF	270.3 m-q	21.5 a-f	19.0 ab	285.7 a
28	Koverall (2 lb) ABCEF + Topguard (14 fl oz) BD + Super Tin (8 fl oz) CE + Badge SC (2 pt) D	288.7 j-o	21.4 a-g	18.9 ab	272.9 a-g
19	Proline (5.7 fl oz) AD + Super Tin (8 fl oz) BE + Koverall (1.5 lb) BE + Minerva Duo (16 fl oz) CF	321.6 g-m	20.7 b-j	18.9 ab	263.1 a-c
27	Koverall (2 lb) ABCEF + Topguard (14 fl oz) B + Super Tin (8 fl oz) CE + Lucento (5.5 fl oz) + Badge SC (2 pt) D	286.7 j-o	21.9 a-d	18.6 b-d	253.5 a-e
42	Headline (12 fl oz) ACE + Manzate Max (1.6 qt) ABCDEF	312.7 h-m	20.8 b-j	18.4 b-d	238.8 c-h
25	Koverall (2 lb) ABCEF + Lucento (5.5 fl oz) B + Super Tin (8 fl oz) CE + Topguard (14 fl oz) D	280.6 l-p	22.2 a-d	18.9 bc	257.2 a-c
29	Koverall (2 lb) ABCEF + Lucento (5.5 fl oz) B + Super Tin (8 fl oz) CE + Badge (2 pt) C + Proline (5 fl oz) D	325.0 g-m	21.5 a-f	18.5 b-d	277.2 a-d
30	Koverall (2 lb) ABCEF + Topguard (14 fl oz) B + Super Tin (8 fl oz) CE + Badge (2 pt) C + Proline (5 fl oz) D	314.7 h-m	20.2 d-k	18.8 bc	267.1 a-c
33	ManKocide (4.3 lb) ABCDEF	321.0 g-m	18.3 i-l	18.1 a-f	235.7 c-h
34	Double Nickel 55 (0.5 lb) ABCDEF + ManKocide (4.3 lb) ABCDEF	317.8 g-m	18.1 k-m	18.6 b-d	253.2 a-e
6	Inspire XT (7 fl oz) A + Manzate Max (1.6 qt) ACE + Dexter Max (2.1 lb) BD + Super Tin (8 fl oz) CE + Cuprofix Ultra 40 (48 oz) F	305.5 h-n	19.4 f-k	19.0 ab	264.6 a-c
14	Brixen (21 fl oz) AD + Minerva Duo (16 fl oz) BE + Super Tin (8 fl oz) CF + Koverall (1.5 lb) CF	383.5 d-g	20.4 d-j	18.1 b-f	264.5 a-c
17	Minerva (13 fl oz) AD + Super Tin (8 fl oz) BE +	334.6 f-m	18.8 j-l	18.3 b-e	251.1 a-e

…	Koverall (1.5 lb) BE + Minerva Duo (16 fl oz) CF				
18	Inspire XT (7 fl oz) A + Super Tin (8 fl oz) BE + Koverall (1.5 lb) BE + Minerva Duo (16 fl oz) CF	320.7 g-m	20.3 d-k	18.6 b-d	259.0 a-c
26	Koverall (2 lb) ABCEF + Lucento (5.5 fl oz) BD + Super Tin (8 fl oz) CE + Badge SC (2 pt/a) D	345.3 f-l	22.0 a-d	18.8 bc	263.2 a-c
11	Brixen (21 fl oz) AD + Super Tin (8 fl oz) BE + Koverall (1.5 lb) BE + Minerva Duo (16 fl oz) CF	347.3 f-l	20.4 d-k	18.9 ab	267.7 a-c
15	Minerva Duo (16 fl oz) ACDF + Inspire XT (7 fl oz) BE +	322.7 g-m	18.7 j-l	18.1 b-f	258.3 a-c
16	Minerva Duo (16 fl oz) AD + Super Tin (8 fl oz) BE + Koverall (1.5 lb) BE + Inspire XT (7 fl oz) CF	354.1 f-j	18.6 j-l	18.1 a-f	232.0 c-i
22	Badge SC (1.5 pt) ABCDEF + Manzate Max (1.6 qt) ABCDEF	394.8 d-f	19.1 g-k	18.1 b-f	216.6 e-i
24	Manzate Max (1.6 qt) AD + Super Tin (8 fl oz) B + Badge SC (1.5 pt) BCDE + Eminent (13 fl oz) C + Topguard (14 fl oz) E + Badge SC (2 pt) F	357.0 f-i	18.6 j-l	18.8 bc	273.2 a-f
32	LifeGard WG (4.5 oz/100gal) ABCDEF + Inspire XT (7 fl oz) AC + Super Tin (8 fl oz) BD	370.0 e-h	18.7 j-l	18.2 b-e	248.5 a-e
12	Exp 2 (32 fl oz) AD + Super Tin (8 fl oz) BE + Koverall (1.5 lb) BE + Minerva Duo (16 fl oz) CF	432.5 c-e	19.3 f-k	17.8 c-f	243.9 c-g
20	Exp 3 (8 fl oz) AD + Super Tin (8 fl oz) BE + Koverall (1.5 lb) BE + Minerva Duo (16 fl oz) CF	368.3 e-h	20.8 b-j	18.2 b-f	245.1 c-g
23	Manzate Max (1.6 qt) AC + Eminent (13 fl oz) B + Badge SC (1.5 pt) BCDE + Super Tin (8 fl oz) D + Proline (5.7 fl oz) E + Badge SC (2 pt) F	349.1 f-k	20.4 d-j	18.6 b-d	253.4 a-e
13	Super Tin (8 fl oz) AD + Koverall (1.5 lb) BE + Exp 2 (32 fl oz) BE + Minerva Duo (16 fl oz) CF	373.5 e-h	18.4 h-l	17.6 d-f	231.5 c-i
38	Inspire XT (7 fl oz) AC + Stargus (1 qt) ABCDEF + Super Tin (8 fl oz) BD	400.8 c-f	19.3 f-k	18.5 b-d	232.7 c-i
40	Headline (12 fl oz) ACE + Manzate Max (1.6 qt) BDF	383.1 d-g	19.4 f-k	17.3 e-g	237.1 c-h
41	Manzate Max (1.6 qt) ABDF + Headline (12 fl oz) CE	354.8 f-j	19.9 d-k	17.9 a-f	227.9 b-i
21	Badge SC (2 pt) ABCDEF	447.1 cd	16.7 l-n	17.6 d-f	246.1 a-e
39	Regalia (1 qt) ABCDEF + Badge SC (2 pt) ABCDEF	465.5 bc	16.7 l-n	17.1 fg	237.7 c-h
31	LifeGard WG (4.5 oz/100gal) ABCDEF	527.6 ab	15.7 m-o	16.2 gh	198.9 hi
37	Stargus (2 qt) ABCDEF	442.6 cd	14.5 no	15.4 h	200.3 hi
1	Non-Treated Control	558.3 a	13.6 o	15.2 h	194.5 i

[z] All rates, unless otherwise specified, are listed as a measure of product per acre. MasterLock was added to all tank mixes at a rate of 0.25 % v/v.

[y] Application letters code for the following dates: A=26 Jun, B=8 Jul, C=22 Jul, D=31 Jul, E=14 Aug, F=23 Aug.

[x] Area under the disease progress curve was calculated using disease severity (0-10 scale).

[w] Column values followed by the same letter were not significantly different based on Fisher's Protected LSD (α=0.05).

[v] Pounds of recoverable white sugar per ton of beets.

[u] Exp=experimental compound.