

Effect of Headline plus Adjuvants on Cercospora Leaf Spot Control and Yield and Quality on Sugarbeet

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INTRODUCTION AND OBJECTIVE

In 1999, Headline was used with the adjuvants Agri-dex at 1% v/v, Methylated Seed Oil at 1% v/v, X-77 at 0.25% v/v and Silwet L-77 at 0.09% v/v at Crookston, Foxhome, Willmar and Gluek. No phytotoxicity was observed at Crookston, Willmar or Gluek. Minor phytotoxicity was observed at Foxhome. In 2000, Headline was used with Agri-dex at 1% v/v at Crookston, Breckenridge, Maynard and Renville. No phytotoxicity was observed at Maynard or Renville. Phytotoxicity was observed at Crookston and Breckenridge. As a result, in 2001 and 2002, at Breckenridge, five adjuvants were applied at varying rates with Headline to determine at what rate they can be used without causing phytotoxicity on sugarbeet.

MATERIALS AND METHODS

The research was conducted on Doug Tischer's farm near Breckenridge, Minnesota on, a silty clay loam soil between May 11 and September 24, 2001 and between May __ and September 23, 2002. HM Agate sugarbeet seed was planted into plots 11 feet in width (6-22 inch rows) and 35 feet in length. Plots were thinned manually to 150 sugarbeet plants per 100 feet of row at the 6-leaf stage. The experiments were arranged in a randomized complete block design with 4 replications. Treatments were applied to the center four rows of each 6-row plot with a boom sprayer operating at 100 psi and delivering 20 gallons of spray solution per acre through a 4-nozzle boom. Treatments were applied July 25, August 8 and 22, and September 5, 2001. The 2002 treatments were applied July 23, August 9 and 26, and September 9. Standard cultural practices were used for fertilization and weed control. In 2001, a 1-10 phytotoxicity rating was developed, where 1 represented no phytotoxicity and 10 represented severely burned outer leaves. A phytotoxicity rating was done on September 6, 2001. For 2002, a scale of 0-5 was used to determine foliar damage, with 0 representing no injury and 5 representing severe outer leaf injury. Damage ratings were conducted within 3 days following each application in 2002. The middle two rows of each plot were harvested on September 24, 2001. In 2002, the center two rows of each plot were harvested on September 23. Quality analysis was conducted at the American Crystal Sugar Company Tare Laboratory in East Grand Forks, MN. Yields were determined and the data was analyzed for differences by analysis of variance and LSD using Agricultural Research Manager version 6.0.

RESULTS AND DISCUSSION

Results from the 2001 trial are shown in [Table 1](#). Headline (BAS 500) with the adjuvants Agri-dex at 0.5% v/v and 1% v/v, with Methylated Seed Oil at 0.5% v/v and 1% v/v and with Hyperactive at 0.06% and 0.25% v/v resulted in either no phytotoxicity or minor phytotoxicity (spotting) to the sugarbeet leaves and high recoverable sugar per acre. Headline applied with Silwet L-77 at 0.12% and 0.25% v/v and Activator 90 at 0.5%, 1% and 2% v/v resulted in significant leaf burning and adversely impacted the sugar loss to molasses. Activator 90 at 1% v/v applied alone also caused severe leaf burning and significantly reduced yield.

In 2002, when compared with Headline alone, there was no statistical difference between any of the treatments containing Headline plus adjuvant. A trend toward higher recoverable sugar per acre was observed when the lower rates (0.25% v/v) of MSO, Activator 90 and Agri-dex or the low rate (0.03% v/v) of Hyperactive were used. Addition of Silwet L-77, at all rates tested, resulted in lower recoverable sugar per acre, although not significantly. Headline applied with MSO at all rates, Headline applied with Agri-dex at all rates and Headline applied with Silwet L-77 at 0.125% and 0.25% resulted in significantly higher phytotoxicity than Headline applied at the recommended rate of 0.15 lbs. ai. When Headline was applied at twice the recommended rate (0.3 lbs. a.i.), significantly more phytotoxicity was observed in all treatments except Headline at 0.3 lbs. a.i. plus Hyperactive at 0.25% v/v. All treatments containing Hyperactive gave similar phytotoxicity results. Results from 2002 are shown in [Table 2](#).

Table 1. Effect of BAS 500 with Adjuvants on Sugarbeet Yield and Phytotoxicity at Breckenridge, 2001

Treatment and rate/acre	* Phyto-toxicity	Recoverable Sucrose		Root Yield	Sucrose Content	LTM**
		(lb/A)	(lb/T)			
BAS 500 2.09 EC 0.15 lb a.i + Agri-dex 0.5%.....	1.5	6719.4	319.0	19.73	17.31	1.4
BAS 500 2.09 EC 0.3 lb a.i + Hyper Active 0.25%.	2.0	6656.8	297.9	22.77	16.27	1.4
BAS 500 2.09 EC 0.15 lb a.i + Methylated Seed Oil 0.5% v/v.....	1.5	6634.5	304.3	20.68	16.62	1.4
BAS 500 2.09 EC 0.15 lb a.i + Agri-dex 1%	1.5	6634.0	304.8	20.74	16.54	1.3
BAS 500 2.09 EC 0.15 lb a.i + Hyper Active 0.06% v/v	1.0	6417.0	303.9	18.33	16.60	1.4
BAS 500 2.09 EC 0.15 lb a.i + Methylated Seed Oil 1% v/v	1.8	6331.2	302.5	19.57	16.55	1.4
BAS 500 2.09 EC 0.15 lb a.i + Agri-dex 2%	2.0	6273.6	303.8	19.30	16.64	1.5
BAS 500 2.09 EC 0.15 lb a.i + Agri-dex 0.25%.....	1.5	6224.4	305.7	20.52	16.59	1.3
BAS 500 2.09 EC 0.15 lb a.i + Hyper Active 0.03% v/v	1.0	6127.6	320.3	17.38	17.42	1.4
BAS 500 2.09 EC 0.3 lb a.i + Methylated Seed Oil 2%	2.0	6025.3	307.8	18.73	16.79	1.4
BAS 500 2.09 EC 0.3 lb a.i.	1.0	5955.3	312.2	16.68	17.07	1.5
BAS 500 2.09 EC 0.15 lb a.i	1.5	5803.3	310.7	18.66	16.96	1.4
BAS 500 2.09 EC 0.15 lb a.i + Hyper Active 0.25% v/v	1.1	5691.3	315.1	16.06	17.24	1.5
BAS 500 2.09 EC 0.15 lb a.i + Activator 90 0.25% v/v	2.0	5648.5	315.0	18.13	17.07	1.3
BAS 500 2.09 EC 0.15 lb a.i + Activator 90 1% v/v	4.0	5637.6	300.2	19.97	16.43	1.4
Methylated Seed Oil 1%	1.1	5453.2	308.1	17.76	16.89	1.5
BAS 500 2.09 EC 0.15 lb a.i + Hyper Active 0.125% v/v	1.2	5446.7	291.5	18.28	15.98	1.4
BAS 500 2.09 EC 0.15 lb a.i + Methylated Seed Oil 0.25% v/v	1.3	5426.3	313.8	15.42	17.04	1.3
BAS 500 2.09 EC 0.15 lb a.i + Activator 90 0.5% v/v	3.5	5397.6	303.7	17.98	16.73	1.5
Check.....	1.0	5352.6	310.1	15.84	16.93	1.4
BAS 500 2.09 EC 0.3 lb a.i + Silwet L-77 0.25%	8.3	5242.5	321.7	16.40	17.43	1.3
BAS 500 2.09 EC 0.3 lb a.i + Agri-dex 2%	2.0	5223.8	307.6	16.37	16.69	1.3
BAS 500 2.09 EC 0.15 lb a.i + Silwet L-77 0.06% v/v	2.0	5215.4	303.9	17.44	16.62	1.4
Agri-dex 1%	1.0	5169.4	300.7	16.88	16.51	1.5
BAS 500 2.09 EC 0.15 lb a.i + Silwet L-77 0.25% v/v	8.0	5015.9	310.2	16.77	16.93	1.4
Hyper Active 0.125%	1.0	4988.2	294.3	17.22	16.22	1.5
BAS 500 2.09 EC 0.15 lb a.i + Silwet L-77 0.03% v/v	2.5	4953.6	308.6	16.24	16.82	1.4
Silwet L-77 0.12.....	1.1	4894.8	312.4	16.28	17.08	1.5
BAS 500 2.09 EC 0.15 lb a.i + Methylated Seed Oil 2% v/v.....	2.5	4836.0	308.6	15.00	16.92	1.5
BAS 500 2.09 EC 0.3 lb a.i + Activator 90 2%	8.0	4722.5	298.0	15.92	16.51	1.6
BAS 500 2.09 EC 0.15 lb a.i + Activator 90 2% v/v	7.0	4506.2	306.2	15.01	16.79	1.5
BAS 500 2.09 EC 0.15 lb a.i + Silwet L-77 0.12% v/v	6.5	4424.0	310.4	13.92	16.93	1.4
Activator 90 1% v/v.....	8.5	3958.6	312.0	13.23	17.03	1.4
LSD (P=0.05)	0.46	1352.1	19.5	5.88	0.94	0.1
CV%	11.84	17.41	4.53	23.92	3.98	7.44

*Phyto-toxicity rating of 1-10 (no leaf burning or spotting – severely burnt outer leaves)

**LTM: Sugar loss to molasses

Table 2: Effect of Headline plus Adjuvants on Yield, Quality and Cercospora Control on Sugarbeet, 2002

Treatment	Rate	Recoverable	Recoverable	Yield	%	%	* CLS	**Phytotoxicity
		Sugar / Acre	Sugar / Ton		Sucrose	SLM		
Headline + MSO	0.15 + 0.25% v/v	7610.8	260.4	29.7	15	1.97	1.1	0.875
adline + Activator 90	0.15 + 0.25% v/v	7372.7	273.3	27.4	15.6	1.9	1.13	0.625
leadline + Agridex	0.15 + 0.25% v/v	7339.4	254.7	29.3	14.7	1.95	1.1	0.875
leadline + Agridex	0.15 + 0.5% v/v	7256.1	254.2	29.0	14.7	1.95	1.17	1.000
adline + Hyperactive	0.15 + 0.03% v/v	7229.3	249.8	29.4	14.5	2.05	1.10	0.500
leadline + Agridex	0.15 + 2% v/v	7190.8	253.0	28.9	14.6	1.97	1.07	2.000

Headline + MSO	0.15 + 1%v/v	7145.7	263.4	27.5	15.2	2.00	1.17	1.875
adline + Hyperactive	0.15 + 0.25% v/v	7133.6	255.6	28.3	14.8	1.98	1.15	0.563
Headline + MSO	0.15 + 2% v/v	7015.6	267.1	26.7	15.2	1.88	1.10	2.563
Headline	0.3 lb ai	7004.6	259.8	27.4	14.9	1.92	1.05	1.000
adline + Silwet - 77	0.15 + 0.06% v/v	6972.7	259.7	27.1	14.8	1.80	1.10	0.813
Headline	0.15 lb ai	6966.7	257.4	27.4	14.9	1.97	1.10	0.500
Headline + MSO	0.3 + 2% v/v	6929.0	258.7	27.3	14.9	1.95	1.07	2.500
adline + Activator 90	0.15 + 1%v/v	6907.4	262.0	26.7	15.0	1.90	1.13	1.875
adline + Silwet - 77	0.15 + 0.03% v/v	6893.7	247.8	28.3	14.5	2.08	1.10	0.500
adline + Silwet - 77	0.15 + 0.125% v/v	6875.7	255.1	27.4	14.7	1.95	1.10	1.375
adline + Hyperactive	0.3 + 0.25% v/v	6824.6	252.8	27.5	14.5	1.85	1.13	0.688
leadline + Agridex	0.15 + 1%v/v	6812.8	242.2	28.6	14.3	2.20	1.05	1.188
Hyperactive	0.125% v/v	6770.2	254.9	26.9	14.6	1.88	3.30	0.625
adline + Hyperactive	0.15 + 0.06% v/v	6744.7	244.7	28.0	14.3	2.08	1.15	0.563
adline + Activator 90	0.15 + 2% v/v	6681.6	250.7	27.0	14.6	2.05	1.10	2.313
Headline + MSO	0.15 + 0.5% v/v	6586.5	243.8	27.4	14.2	1.97	1.15	1.250
leadline + Agridex	0.3 + 2% v/v	6534.4	243.6	27.4	14.3	2.10	1.10	1.750
adline + Silwet - 77	0.15 + 0.25% v/v	6525.2	246.4	26.9	14.3	1.92	1.10	2.750
Silwet L-77	0.125% v/v	6495.5	248.8	26.5	14.5	2.05	2.88	0.313
adline + Hyperactive	0.15 + 0.125% v/v	6445.1	246.5	26.7	14.2	1.92	1.08	0.688
adline + Activator 90	0.3 + 2% v/v	6430.1	253.2	25.8	14.7	2.00	1.10	2.438
adline + Activator 90	0.15 + 0.5% v/v	6330.2	251.1	25.5	14.6	2.00	1.07	1.250
Activator 90	1% v/v	6322.5	245.1	26.3	14.4	2.12	2.63	0.563
MSO	1% v/v	6188.2	237.7	26.6	14.1	2.22	2.90	0.625
Agridex	1% v/v	6167.5	240.7	26.0	14.3	2.30	2.85	0.500
adline + Silwet - 77	0.3 + 0.25% v/v	6118.6	251.1	24.7	14.6	2.00	1.05	3.125
Untreated Check		5411.4	222.6	24.8	13.6	2.45	3.80	0.250
LSD (P=0.05)		817.3	25.1	2.1	1.1	0.27	0.27	0.361
CV		8.63	7.12	5.59	5.36	9.53	13.09	21.1

* CLS Rating is based on KWS Scale (1= No Cercospora; 9 = Severe Cercospora Damage)

**Phytotoxicity rating 0-5 (0 = no injury; 5 = Severe outer leaf burning)