2018 RESEARCH REPORT

SAGINAW VALLEY

RESEARCH & EXTENSION CENTER

MICHIGAN STATE UNIVERSITY

AgBioRESEARCH

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SAGINAW VALLEY RESEARCH AND EXTENSION CENTER REPORT

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INTRODUCTION

The Michigan sugar beet grower cooperative, Michigan Sugar Company, and the Michigan dry bean growers and industry represented by the Michigan Bean Commission and Michigan Bean Shippers Association, donated the proceeds of the 120 acre Saginaw Valley Bean and Beet Research Farm, located in Saginaw County for 38 years, to Michigan State University in 2009. The Michigan State University Office of Land Management purchased and operates a 320 acre farm near Richville Michigan in Denmark Township. The site is being established as an AgBioResearch research center. The Education Center was completed in 2016 and has hosted numerous events and expanded the partners associated with the farm in 2018. An additional 150 acres was purchased with the help of funds from the Michigan Wheat Industry to expand wheat research in the region. 75 acres of land was sold in 2017 bringing the total acres to 400 acres. 75 acres of the 150 acres bought is being leased by the previous tenant as per a previous agreement for the 2019 season. In 2018 the house on Van Buren Road was demolished the land being reclaimed for farming. The site is located on the southeast corner of Reese and Krueger Roads, address of 3775 South Reese Road, Frankenmuth, Michigan 48734. Field research was initiated in 2009 and the 2018 season was the tenth season of research at the site. This research report is primarily a compilation of research conducted at the site in 2018. Most of the work represents one year's results, and even though multi-season results are included, **this work should be considered as a progress report.**

Soil – The soil type on the farm is classified as a Tappan-Londo loam, these are very similar soil types separated by subsoil drainage classifications, the Tappan not being as naturally well drained as the Londo. The site was soil tested in spring 2009 at 2.5 acre increments. The soil pH averages 7.9, soil test phosphorus averages 56 pounds P/acre, soil test Potassium averages 294 pounds K/acre. The soil type on the newly purchased 150 acre site is the same classification, the pH averages 7.5, but does have a few low pH spots (6.5) which have been identified and corrected with liming the fall of 2017. Soil test phosphorus averages 30 pounds P/acre and will be increased with heavier phosphorus applications prior to planting in the spring of 2019. Potassium averaged 230 pounds, which will be corrected also.

Weather – The monthly rainfall for 2018 collected with the automated rain gauge is given in Table 1. The monthly totals are given at the bottom of the table. Rainfall was above average in February and December and below average all other months, with the 7.90" of rain in August being the highest amount of precipitation since 1988. Planting in the spring was timely with good rains to help emergence. The rainfall total of 27.53" was average. Maximum and minimum daily temperatures along with growing degree days (base 50^0F) are given in Table 2. The 2018 season was warm with 11 days above 90 degrees and 36 days above 85 degrees. The growing degree days for 2018 was 2756.5, the past three years in a row have been above average. Rainfall was low during in the year and wheat yields were low, but the rain in August made for good fall yields. The average yields for crops grown on the farm was: corn at 190 bushels/acre, soybeans at 80 bushels/acre, wheat at 75 bushels/acre, dry beans at 30 cwt/acre, and sugarbeets at 30 tons/acre.

GROWING DEGREE DAYS - SAGINAW VALLEY RESEARCH FARM

Base 50 (max + min / 2 - 50)

	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	TOTAL
1982	54.50	428.50	365.50	626.00	476.00	298.00	156.00	2404.50
1983	16.00	118.50	491.00	716.00	645.00	369.50	97.00	2453.00
1984	67.50	164.50	506.00	558.50	627.00	282.00	114.50	2320.00
1985	183.50	306.00	388.00	603.50	523.00	394.50	100.00	2498.50
1986	124.50	310.00	435.00	664.00	459.50	370.00	96.50	2459.50
1987	84.00	336.50	566.50	725.50	537.50	334.00	19.50	2603.50
1988	35.50	290.50	544.50	739.50	667.50	283.00	48.00	2608.50
1989	21.50	202.00	456.50	648.00	535.00	315.00	167.00	2345.00
1990	165.50	146.00	493.50	587.50	553.50	332.50	100.50	2379.00
1991	144.00	423.50	541.00	641.00	567.50	289.50	114.00	2720.50
1992	56.00	241.50	367.00	446.50	403.50	257.50	41.50	1813.50
1993	23.50	208.00	430.00	642.00	613.50	184.50	25.00	2126.50
1994	95.50	227.50	526.50	613.50	501.50	380.00	115.00	2459.50
1995	3.00	221.00	536.00	698.50	745.00	225.00	125.50	2554.00
1996	41.00	157.00	486.00	572.00	611.00	357.50	91.50	2316.00
1997	27.00	48.00	534.00	596.50	443.00	299.50	134.50	2082.50
1998	46.00	267.00	505.50	623.50	648.00	456.00	114.00	2660.00
1999	49.50	299.00	578.50	684.50	500.00	339.00	67.50	2518.00
2000	17.00	284.00	474.50	509.50	544.50	289.00	157.00	2275.50
2001	78.00	289.50	504.00	649.50	654.00	282.00	114.00	2571.00
2002	123.00	141.50	535.00	710.00	575.00	443.00	99.00	2626.50
2003	66.50	147.50	410.00	606.00	608.00	312.50	82.00	2232.50
2004	89.00	240.50	429.50	561.00	450.50	421.50	69.00	2261.00
2005	58.00	145.00	623.00	647.50	611.50	429.00	130.00	2644.00
2006	79.00	283.50	470.50	661.00	555.50	260.00	38.50	2348.00
2007	53.50	277.00	534.00	564.00	594.00	393.00	231.00	2646.50
2008	110.00	116.50	512.00	620.00	532.50	343.00	56.50	2290.50
*2009	50.50	190.00	432.00	458.50	517.50	345.00	27.00	2020.50
2010	89.00	368.50	528.50	729.00	697.50	311.50	95.00	2819.00
2011	38.00	273.00	515.00	758.50	576.50	308.50	122.50	2592.00
2012	28.00	341.00	555.50	756.00	552.00	295.00	109.50	2637.00
2013	45.50	347.50	483.50	617.00	516.00	288.00	131.50	2429.00
2014	45.50	271.50	536.00	488.00	525.00	285.00	74.00	2225.00
2015	18.00	306.00	444.50	577.00	546.50	342.00	90.50	2324.50
2016	37.50	274.00	509.00	688.50	680.00	430.50	189.50	2809.00
2017	99.50	227.50	546.00	609.50	506.00	411.50	204.50	2604.50
2018	14.50	417.00	509.50	664.00	649.50	422.00	115.00	2791.50
AVERAGE	64.27	252.32	494.68	628.68	566.19	334.57	104.42	2445.12

* Station moved to from Saginaw, MI to Richville, MI

MAXIMUM-MINIMUM AIR TEMPERATURES (F)
SAGINAW VALLEY RESEARCH & EXTENSION CENTER - 2018

	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE	
DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	13	0	32	9	36	30	38	23	85	53	82	53
2	19	6	18	9	42	24	44	18	85	65	66	49
3	16	2	28	12	38	22	40	31	68	52	73	52
4	11	-5	29	-2	40	20	32	24	73	52	73	55
5	4	-8	18	-4	38	17	38	21	80	49	66	49
6	6	-7	19	2	35	27	40	17	65	41	72	45
7	31	-4	20	3	30	22	29	13	68	35	82	58
8	35	24	20	4	31	21	35	15	81	47	79	54
9	37	7	20	8	33	25	36	27	79	54	67	57
10	48	23	18	2	32	20	45	26	66	47	73	56
11	57	47	24	5	33	15	53	29	47	36	81	49
12	52	10	28	0	33	18	69	37	60	37	80	51
13	13	0	27	-2	31	17	51	35	70	42	82	59
14	17	-1	41	19	38	18	36	26	77	51	84	54
15	18	8	42	33	33	20	33	26	70	49	81	48
16	18	3	33	23	35	17	35	28	79	43	83	63
17	26	-4	33	20	44	15	35	26	65	47	93	66
18	27	16	38	25	55	24	39	30	74	44	88	68
19	36	20	39	33	35	20	49	31	70	52	75	59
20	41	31	59	36	35	20	55	25	60	47	76	54
21	38	30	53	28	37	22	60	31	65	40	78	49
22	46	33	38	27	44	21	63	30	62	49	77	52
23	44	24	44	29	39	20	73	29	82	49	75	60
24	26	19	36	31	36	15	66	50	84	53	74	55
25	33	20	47	35	38	13	51	36	89	58	76	48
26	50	25	47	29	49	17	62	29	86	67	80	45
27	49	32	59	34	51	38	55	35	92	61	70	62
28	35	27	59	35	47	33	51	30	92	61	85	59
29	28	13			45	36	58	25	89	65	89	63
30	22	11			44	27	73	32	84	65	92	75
31	37	18			45	29			86	70		

MAXIMUM-MINIMUM AIR TEMPERATURES (F)
SAGINAW VALLEY RESEARCH & EXTENSION CENTER - 2018 cont.

	JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	93	73	81	59	83	62	53	47	46	40	35	16
2	94	68	84	59	85	67	57	50	43	38	51	33
3	90	60	81	61	83	69	80	51	43	28	37	26
4	93	66	88	59	89	68	77	40	48	28	31	19
5	92	74	90	70	89	69	55	36	53	40	30	24
6	75	56	77	67	73	55	75	54	52	42	31	21
7	81	47	84	64	69	48	57	50	43	34	28	19
8	86	51	81	66	66	50	84	51	38	34	28	16
9	88	59	82	62	66	47	86	66	35	25	31	14
10	83	61	81	58	63	54	76	64	36	22	30	23
11	82	53	83	57	76	49	69	43	35	27	31	25
12	84	52	81	58	78	51	46	39	36	29	35	19
13	88	63	85	58	75	51	52	34	31	22	38	25
14	82	68	85	60	82	57	60	36	32	20	37	30
15	90	65	85	64	82	59	49	32	33	21	35	28
16	88	68	81	63	86	56	55	31	35	29	32	26
17	79	58	76	67	88	58	46	32	34	28	34	28
18	78	55	79	61	76	60	51	24	36	25	33	25
19	85	51	82	61	76	62	55	39	36	25	44	28
20	81	62	79	60	75	74	53	34	33	22	42	34
21	73	67	77	63	81	72	42	30	33	16	38	29
22	69	63	75	56	64	71	58	31	26	15	30	27
23	79	62	79	52	70	70	52	36	48	25	33	29
24	80	67	77	55	66	70	47	30	46	40	32	27
25	83	59	76	62	78	69	54	24	42	32	32	26
26	79	60	84	66	70	69	53	36	33	25	33	28
27	76	56	87	67	65	68	44	38	28	24	47	30
28	77	54	85	66	58	66	42	37	29	24	54	31
29	82	52	78	58	58	65	53	34	28	24	31	22
30	83	53	71	54	49	63	54	29	37	16	32	24
31	79	53	79	53			54	45			35	26

MONTHLY PRECIPITATION, SAGINAW VALLEY RESEARCH FARM

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1988	1.04	1.01	1.70	3.26	0.56	0.59	3.45	3.52	2.46	3.25	4.36	1.08	26.28
1989	1.09	0.34	1.40	2.05	5.03	6.25	1.06	2.92	4.43	1.72	3.24	0.48	30.01
1990	1.23	1.21	1.17	1.54	2.81	2.07	2.53	6.94	3.74	5.87	4.51	1.45	35.12
1991	0.85	0.60	3.68	6.61	3.71	2.66	4.53	2.61	1.50	3.52	2.04	1.24	31.58
1992	1.20	1.65	1.31	4.56	1.10	2.10	4.33	2.92	4.08	2.54	4.50	2.10	32.39
1993	2.72	0.47	0.87	4.08	2.76	3.03	2.46	4.62	4.00	3.70	1.99	0.53	31.23
1994	0.55	0.66	0.91	3.58	2.04	6.99	2.57	4.44	2.19	2.24	4.40	1.03	31.60
1995	1.67	0.35	1.38	2.72	1.44	1.96	1.29	5.00	1.33	2.39	4.05	0.79	24.37
1996	0.83	0.94	0.49	3.18	5.47	5.65	2.32	1.53	3.52	3.31	1.37	2.21	30.82
1997	1.51	4.25	1.32	1.38	3.00	0.69	2.44	3.61	3.46	1.31	1.03	0.36	24.36
1998	2.66	2.05	3.17	2.14	1.87	1.56	1.02	2.01	1.41	3.18	1.79	1.32	24.18
1999	2.75	0.41	0.62	5.01	2.33	3.07	5.02	3.01	2.52	1.12	1.04	1.90	28.80
2000	0.57	1.35	0.89	2.94	5.34	2.65	3.03	3.69	3.27	0.90	2.07	1.57	28.27
2001	0.33	3.16	0.11	2.38	4.42	2.45	0.53	3.52	4.34	4.90	1.76	1.61	29.51
2002	1.02	1.49	2.47	3.49	4.46	3.15	3.00	4.50	0.50	1.87	1.19	0.97	28.11
2003	0.27	0.21	1.66	0.36	4.19	2.04	2.49	1.33	1.99	1.09	5.35	1.20	22.18
2004	1.09	0.55	2.50	1.31	7.34	2.70	2.01	2.32	0.66	2.41	3.44	1.51	27.84
2005	2.90	0.71	0.62	1.32	1.74	4.97	3.20	0.72	0.72	1.30	3.83	1.49	23.52
2006	1.91	1.57	1.59	1.87	4.17	2.03	5.72	2.61	2.53	3.77	3.05	2.81	33.63
2007	1.11	0.35	1.27	3.02	2..20	1.06	2.59	4.80	2.64	2.86	0.89	1.93	22.52
2008	1.76	2.59	1.23	1.99	1.13	3.88	3.94	2.10	5.61	1.70	1.36	1.21	28.50
*2009	0.01	2.12	1.84	4.69	1.23	4.81	2.73	3.48	0.82	3.61	0.47	1.88	27.69
2010	0.14	0.20	0.40	2.15	3.36	2.71	0.89	1.27	3.11	1.94	1.97	0.42	18.56
2011	0.48	0.24	1.82	4.96	3.86	1.51	1.34	2.98	2.28	2.85	2.74	1.42	26.48
2012	1.86	0.76	1.41	1.19	3.92	1.10	3.62	4.03	1.60	4.29	0.38	1.41	25.57
2013	2.77	0.84	0.36	7.38	3.43	1.73	2.03	1.85	0.58	3.26	2.34	0.74	27.31
2014	0.47	0.55	0.92	3.99	3.06	2.74	4.17	3.90	3.03	2.10	2.07	1.49	28.49
2015	0.59	0.08	0.56	1.97	2.86	2.68	2.20	3.94	2.62	1.96	1.26	2.04	22.76
2016	0.94	0.73	4.09	1.30	1.59	1.51	3.47	5.15	2.03	2.11	2.14	0.81	25.87
2017	2.80	1.98	1.90	5.79	1.97	4.83	1.10	2.26	1.54	3.52	2.08	0.33	30.10
2018	0.71	1.96	0.54	2.82	2.14	1.47	1.98	7.90	1.92	2.65	1.27	2.17	27.53
AVG.	1.28	1.14	1.43	3.07	2.98	2.79	2.68	3.40	2.47	2.69	2.39	1.34	27.65

**Station moved from Saginaw, MI to Richville, MI*

PRECIPITATION - SAGINAW VALLEY RESEARCH & EXTENSION CENTER- 2018

Day:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1			0.01					0.74	0.92	0.87	0.12	0.08
2			0.03					1.69	0.2	0.12	0.23	0.54
3				0.49	0.4	0.11					0.02	0.05
4				0.02	0.24					0.05		
5									0.01	0.26	0.07	
6		0.06	0.02	0.12				0.04	0.11	0.03	0.21	
7				0.01				0.01			0.01	
8	0.01		0.02	0.01				0.95				
9			0.01	0.10	0.05	0.1			0.01		0.14	
10					0.01	0.02			0.08	0.49		
11	0.04	0.01			0.25							
12	0.04	0.14	0.01	0.10	0.04							
13				0.19			0.25				0.05	
14		0.01		0.55	0.05		0.01					0.28
15				0.90	0.39					0.09	0.02	
16				0.30		0.14	0.64				0.16	0.01
17								0.29				
18						0.06						
19	0.03	0.41			0.11							
20		0.95			0.01				0.09	0.08		0.07
21		0.32					0.29	1.26	0.02			0.31
22	0.58				0.33	0.01	0.11					
23	0.01	0.05				0.16	0.01					
24						0.1	0.67				0.16	
25		0.01		0.02				0.29	0.19			
26					0.07						0.01	0.01
27			0.20	0.01		0.77		1.49		0.05		0.10
28								0.88	0.02	0.15		
29			0.04					0.26				
30					0.01				0.27	0.13	0.07	
31			0.20		0.18					0.33		0.72
TOTAL	0.71	1.96	0.54	2.82	2.14	1.47	1.98	7.90	1.92	2.65	1.27	2.17

Rainfall is measured in inches

2018 YEAR END TOTAL - 27.53 INCHES

2018 Mole Pepper Variety Trial

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This project was undertaken with a client who wanted to make mole (pronounced "moh-lay") sauces from Michigan-grown and Michigan-dried poblano (dried ancho), chilaca (dried pasilla), mirasol (dried guajillo) peppers. The peppers must be fully ripened before drying for the right flavor. Therefore, the main interest of this study was to determine which varieties would yield the most ripe colored fruit before the first frost. A secondary objective of this project was to dry the peppers, covered in a separate report.

Materials and Methods

The mole pepper variety trial was planted at the Saginaw Valley Research and Extension Center (43.399097, -83.694497, Frankenmuth, Michigan). The soil type was a Tappan-Londo loam with a poor-moderate drainage class. On 30 May 180 pounds 46-0-0 was preplant incorporated, resulting in ~80 lb N per acre. The same day, 13 varieties were transplanted in a completely randomized block design with four replications. Sakata (SK), PanAmerican (PAN), Seigers and Harris seed companies and private Wisconsin breeder, James Nienhuis (JN), donated seeds to the trial. Varieties donated by Seigers are owned by Seminis (SG) and US Agriseed (UA). The variety donated by Harris is owned by Seminis. Transplants were started by a local greenhouse on 7 April in 72-cell trays and were eight inches tall at transplanting. Plots consisted of a single row 20 ft long. Rows were 40 inches on-center, with a 16 inch in-row spacing, targeting 7,800 plants per acre. After transplanting, on 30 May, Dual Magnum (s-metolachlor) and Command (clomazone) preemergent herbicide was applied between the rows, each at 1 pint per acre rates. On 10 July, the plots were broadcasted with 90 pounds 46-0-0, resulting in an additional 40 lb N per acre. Plots were hoed three times.

Weather at transplant was hot and dry at transplanting, and supplemental water was manually applied with a water truck and garden hose, two days after transplanting. Disease pressure was nonexistent, weed control was excellent, and hornworms occurred in low quantities.

Starting 12 September, red peppers were harvested from all plants in each 20-foot row (between 11 and 16 plants) and total red fruit weights were recorded for each plot. A second harvest occurred on 26 September, and on the final harvest on 11 October breaker fruit were also counted and weighed. Fruit with spots and rots were counted and factored into the cull rate of all fruits, including breakers. Two attempts were made to dry the fruits, and that is covered in a separate report.

Results and Discussion

All peppers varieties tended to lean over as they grew, and many fruits touched the ground with their tips or were sunburned on the western side of the rows as the plant leaned and exposed fruit from under their leaves. The longer, thinner fruits of SHP9018, Holy Mole and Durango were straighter on more upright plants.

All poblanos had ripe fruits by 26 Sept, but Capitan and Vencedor were the earliest to reach maturity on 12 Sept (Figure 1). Don Matias was the only entry to yield more ripe fruit

with each successive harvest. Masivo had a high incidence of stip disorder resulting in a cull rate at 57% (Table 1). Both Don Matias and Hidalgo ripened to a dark chocolate color that was hard to differentiate from the dark green immature fruit, and also made it harder to grade out culls from stip disorder that were easy to spot on red fruit.

The yields of chilaca peppers are found in Table 2. Overall, Holy Mole and SHP9018 performed statistically identical in all respects. Ripe fruit were first picked on 26 September, and this is the date when the most ripe fruit were picked (Figure 2). Both chilaca peppers ripened to a dark chocolate and tended to curve as plants leaned over.

The yields of the one guajillo pepper (Durango), the roasting pepper (Wisconsin Wroaster), and the aji pepper (Aji Rico) are in Table 3. These were not statistically compared with each other, chilacas or poblanos because they are not similar peppers.

- Wisconsin Wroaster yielded the most red fruit at the earliest picking date on 12 September. The wall thickness of this pepper was similar to the poblanos, but the fruits were generally smaller and with an inverted calyx allowing water to shed instead of collecting in the top of the fruit (Figure 2).
- Durango yielded more ripe fruit with each successive harvest (Figure 2). The wall thickness of Durango was the thinnest in the trial, which is a good drying quality. But, it is worth noting that this variety exhibited high incidence of blossom end rot, resulting in 44% of the red peppers to be culled.
- Aji Rico yielded an enormous amount of small fruit that peaked on 26 September. This pepper is the only *Capsicum baccatum* in the trial, and was more stunted by the preemergent herbicides than other varieties. They grew in a more compact shape that resulted in fewer fruit touching the ground from the plant leaning over.

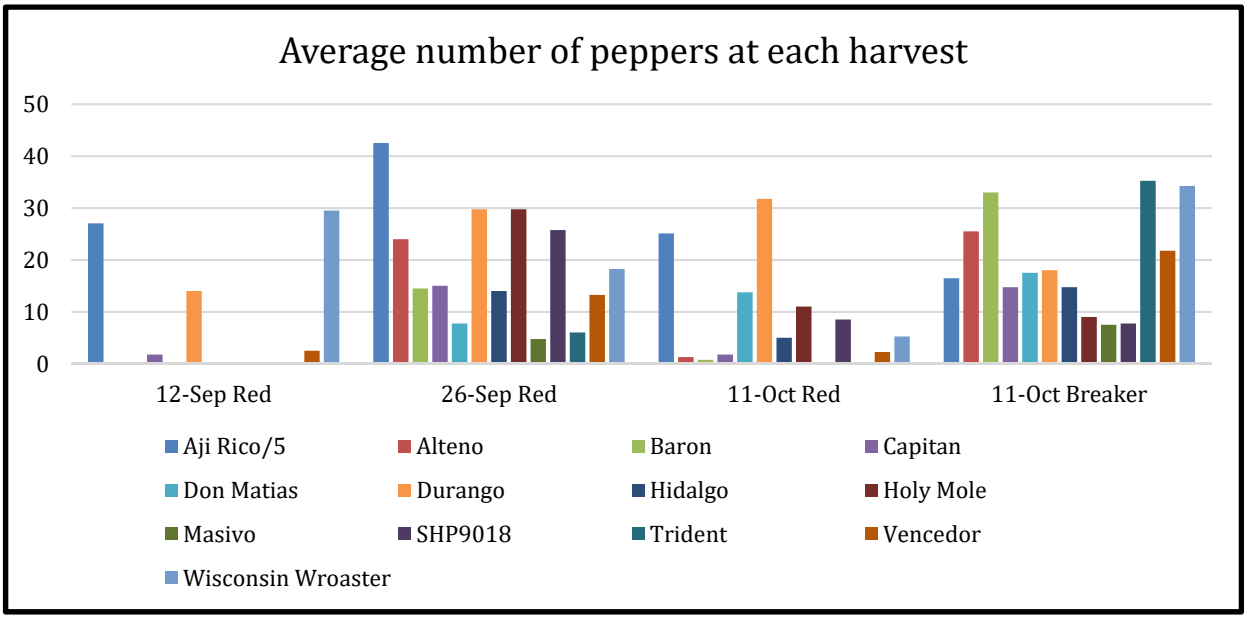

Figure 1. Average number of peppers at each harvest. Aji Rico numbers were divided by five to maintain readability. Both ripe and breaker peppers harvested on 11 October and counted separately.

Table 1. Yield and cull data on nine poblano pepper varieties planted at the Saginaw Valley Research and Extension Center in 2018. Values are averaged across four replicates. Values in **bold** indicate that the variety performed statistically similar to the variety with the highest value for that column, as determined through a Least Significant Difference test at alpha = 5% and a two-tailed t-statistic $_{(21,0.05\%)}$. NS indicates that there were no significant differences between varieties. Plots consisted of a single row 20 ft long. Rows were 40 inches on-center, with a 16 inch in-row spacing, targeting 7,800 plants per acre.

Variety	Company	Ripe fruit per acre	Pounds of ripe fruit per acre	Pounds per ripe fruit	Ripe fruit per plant	% red fruit
Alteno	SK	**16,514.86**	**4,251.35**	**0.26**	**1.86**	49.75
Don Matias	SE	**14,062.16**	**3,548.24**	0.25	**1.50**	55.13
Capitan	SK	**12,100.00**	**3,114.93**	**0.27**	**1.38**	55.64
Hidalgo	SE	**12,427.02**	**2,992.30**	0.25	**1.33**	56.30
Vencedor	SE	**11,772.97**	**2,910.54**	0.25	**1.28**	45.28
Baron	SE	**9,974.32**	**2,477.23**	0.25	**1.17**	31.61
Trident	SK	4,087.84	1,136.42	**0.28**	0.50	15.06
Masivo	UA	3,270.27	866.62	**0.27**	0.37	40.00
Mean	-	10,526.18	2,662.20	0.26	1.17	-
CV	-	50.17	59.03	7.16	50.97	-
t-value	-	2.08	2.08	2.08	2.08	-
LSD	-	7,765.30	1,890.42	0.03	0.88	-
p-value	-	0.0213	0.0180	0.0043	0.0310	-
Variety	**Total % cull**	**Breaker fruit per acre**	**Pounds of breaker fruit per acre**	**Pounds per breaker fruit**	**Breaker fruit per plant**	**% breaker fruit**
Alteno	11.78	**16,678.37**	**4,889.05**	0.30	**1.86**	50.25
Don Matias	25.75	11,445.94	2,877.84	0.25	1.19	44.87
Capitan	19.70	9,647.30	2,411.82	0.25	1.14	44.36
Hidalgo	19.96	9,647.30	2,918.72	0.30	1.04	43.70
Vencedor	13.72	14,225.67	3,376.55	0.24	1.57	54.72
Baron	13.75	**21,583.78**	**6,466.96**	0.30	**2.66**	68.39
Trident	23.68	**23,055.40**	**7,856.82**	**0.36**	**2.31**	84.94
Masivo	**57.62**	4,905.40	1,357.16	0.28	0.55	60.00
Mean	23.25	13,898.65	4,019.37	0.29	1.54	-
CV	44.21	40.60	35.55	13.98	36.47	-
t-value	2.08	2.08	2.08	2.08	2.08	-
LSD	15.11	8,298.24	2,101.13	0.06	0.82	-
p-value	0.0001	0.0021	<0.0001	0.01	0.00	-

Table 2. Yield and cull data on two chilaca pepper varieties planted at the Saginaw Valley Research and Extension Center in 2018. Values are averaged across four replicates. Values in bold indicate that the variety performed statistically similar to the variety with the highest value for that column, as determined through a Tukey test Minimum Significant Difference (MSD) at alpha = 5%.

Variety	Company	Ripe fruit per acre	Pounds of ripe fruit per acre	Pounds per ripe fruit	Ripe fruit per plant	% red fruit
Holy Mole	SE	**26,652.70**	**3,041.35**	**0.11**	**2.67**	81.91
SHP9018	SK	**22,401.35**	**2,550.81**	**0.11**	**2.32**	81.55
Mean	-	24,527.02	2,796.08	0.11	2.49	-
CV	-	27.73	24.62	9.32	26.97	-
MSD	-	15,307.57	1,548.93	0.02	1.51	-
p-value	-	0.4419	0.3878	0.9442	0.5070	-
Variety	**Total % cull**	**Breaker fruit per acre**	**Pounds of breaker fruit per acre**	**Pounds per breaker fruit**	**Breaker fruit per plant**	**% breaker fruit**
Holy Mole	**24.43**	**5,886.49**	**866.62**	**0.15**	**0.59**	18.09
SHP9018	**21.55**	**5,068.92**	**654.05**	**0.13**	**0.52**	18.45
Mean	22.99	5,477.70	760.34	0.14	0.56	-
CV	13.75	26.14	20.10	11.35	24.84	-
MSD	7.11	3,221.83	343.87	3.18	3.18	-
p-value	0.29	0.48	0.14	0.04	0.31	-

Table 3. Yield and cull data on a guajillo pepper (Durango), roasting pepper (WI Wroaster), and aji pepper (Aji Rico) planted at the Saginaw Valley Research and Extension Center in 2018. Values are averaged across four replicates. Analyses were not performed on these varieties because they are not directly comparable to each other, or to the poblano peppers in Table 1 or chilaca peppers in Table 2.

Variety	Company	Ripe fruit per acre	Pounds of ripe fruit per acre	Pounds per ripe fruit	Ripe fruit per plant	% red fruit
Durango	SK	49,381.07	4,651.96	0.10	5.66	80.75
CV	-	24.05	16.86	10.26	15.03	-
WI Wroaster	JN	34,664.86	4,799.12	0.14	4.00	60.74
CV	-	14.53	15.46	5.04	11.71	-
Aji Rico	PAN	309,531.00	12,901.21	0.04	36.85	85.19
CV	-	22.43	16.30	17.78	16.35	-
Variety	**Total % Cull**	**Breaker fruit per acre**	**Pounds of breaker fruit per acre**	**Pounds per breaker fruit**	**Breaker fruit per plant**	**% breaker fruit**
Durango	44.44	11,772.97	1,095.54	0.09	1.31	19.25
CV	12.14	58.97	57.96	7.72	50.03	-
WI Wroaster	12.25	22,401.35	3,057.70	0.14	2.57	39.26
CV	46.07	43.20	41.61	3.39	39.05	-
Aji Rico	7.42	53,795.93	2,305.54	0.04	6.53	14.81
CV	51.07	18.23	18.44	2.34	24.26	-

2018 Seedless Pickling Cucumber Variety Trial

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A pickling cucumber variety trial was planted at the Saginaw Valley Research and Extension Center (43.399097, -83.694497, Frankenmuth, Michigan). Rijk Zwaan (RZ) and Bejo (BJ) seed companies donated parthenocarpic (seedless) cucumber seeds for the trial.

Materials and Methods

On 7 June, 2018, 16 varieties were planted in a completely randomized block design with four replications. Seeds were pre-counted and distributed into four rows by a cone planter. Rows were 20 ft long, 20 inches on-center, with 10 inch in-row spacing targeting 30,000 seeds per acre and hoed to a final population of 26,136 plants per acre. The soil type was a Tappan-Londo loam with a poor-moderate drainage class, typical of the pickling cucumber-growing region of the Saginaw Valley.

On 30 May 180 pounds 46-0-0 was preplant incorporated, resulting in ~80 lb N per acre. On 7 June, Curbit (ethafluralin) and Command (clomazone) preemergent herbicide was applied at 2 pints per acre and 1 pint per acre, respectively. On 3 July, the plots were thinned to one plant every 10 inches. The weather was hot and dry after planting, and no fungicides were required for downy mildew control.

Three reps of all cultivars were harvested and measured on 25 July (day 48). Twenty plants were taken from one of the middle rows in the 4-row plots. All fruit were removed from the plants and sent through a sorter: 4s (> 2” in diameter), 3Bs (1.75 - 2”), 3As (1.5 - 1.75”), 2Bs (1.25 – 1.5”), 2As (1.0625 – 1.25”), and 1s (0.5 – 1.0625”). Harvest weights and L:D ratios of each size class were measured. L:D ratios were measured from ten cucumbers per size class. If there were fewer than ten cucumbers in a size class, they were all measured. If there were no cucumbers in a size class, the cell was marked “N/A”. Fruit per plant, and total bushel per acre yield calculations do not include culls.

Results and Discussion

RZ10, Liszt, RZ6, RZ8, Amarok and Absolut had high yields (Table 1). Rubinstein, Liszt, RZ6, RZ11, Artist, Amarok, Aristan, and Absolut sized up faster in the heat and yielded more fruit in size class 4 at harvest. Cull rates from crooked or nubbed fruit were between 3.87% and 18.69%. RZ8, RZ7, Aristan, RZ10 and Rubenstein appear to be the best performing varieties in 2018, with the highest 3B and 3A yields after factoring in cull and hollow center percentages.

Subplot data measurements of certain size classes within varieties was missing for several entries. Therefore, data on L:D ratios and hollow centers was not analyzed, and only means and coefficient of variation are displayed (Table 2). Despite hot and dry conditions that favored malformations, Aristan, and RZ7 each had low percentages of hollow centers. This suggests an adaptability of those varieties to hot and dry growing conditions. The low percentage for Amour and Ansor is mostly from 2B and 2A size classes and fewer reps.

The L:D ratios trended less than 3 for sizes 3B and 3A, but closer to 3 for sizes 2B and 2A (Table 2). This may have been an environmental effect reflecting the low moisture and heat conditions at the time that 3B and 3A fruit were developing.

Due to high heat and little rain (Table 3), all varieties experienced three separate germination periods over the course of three weeks. By the second week, most of all plants had emerged, but plant sizes were inconsistent in all plots.

Table 1. Yield and quality data on 16 seedless picking cucumber varieties planted at the Saginaw Valley Research and Extension Center in 2018. Values are averaged across three replicates. Values in **bold** indicate that the variety performed statistically similar to the variety with the highest value for that column, as determined through a Least Significant Difference test at alpha = 5% and a two-tailed t-statistic $_{(30,0.05\%)}$. NS indicates that there were no significant differences between varieties. Rows were 20 ft long, 20 inches on-center, with 10 inch in-row spacing targeting 30,000 seeds per acre and hoed to a final population of 26,136 plants per acre.

Variety	Bushels Per Acre						Fruit Per Plant	% Cull
	Total	4	3B	3A	2B	2A		
RZ10	**477.90**	115.26	**277.44**	**59.22**	18.68	7.29	**2.62**	12.51
Liszt	**474.71**	**292.48**	146.69	23.69	6.38	5.47	**2.27**	3.88
Absolut	**391.34**	156.72	179.50	33.26	20.50	1.37	2.02	6.85
RZ6	**387.69**	**200.45**	99.77	**46.47**	22.78	18.22	2.02	11.13
RZ8	**367.19**	21.87	**220.50**	**92.03**	20.50	12.30	2.00	15.01
Amarok	**362.18**	67.42	158.54	**85.65**	**28.70**	**21.87**	**2.40**	7.95
RZ7	349.88	67.88	113.89	**102.05**	**48.75**	17.31	**2.23**	17.96
Aristan	344.41	122.55	116.63	**67.42**	26.42	11.39	1.92	18.69
RZ11	340.77	148.97	123.92	36.90	19.59	11.39	1.82	14.29
Rubinstein	339.86	133.48	129.38	**52.85**	11.84	12.30	1.87	7.83
Bowie	301.68	16.40	147.24	**101.14**	26.88	10.02	1.85	10.86
Artist	293.84	139.41	63.32	23.23	**42.82**	**25.06**	1.80	9.33
Gershwin	280.09	86.56	98.31	**69.70**	21.87	3.64	1.52	9.68
RZ9	206.37	43.73	64.69	42.37	**33.26**	**22.32**	1.47	8.71
Amour	144.42	42.37	38.72	5.92	23.69	**33.71**	1.27	9.31
Ansor	111.16	9.57	16.40	**56.95**	10.02	18.22	0.58	13.09
Mean	323.34	104.07	124.68	56.18	23.92	14.49	1.85	11.07
CV	23.26	60.01	43.89	60.52	51.55	49.27	19.15	58.74
t-value	2.042	2.042	2.042	2.042	2.042	2.042	2.042	2.042
LSD	125.402	104.136	91.243	56.692	20.561	11.906	0.591	NS
p-value	<0.0001	0.000	0.000	0.036	0.020	0.000	<0.0001	0.366

Table 2. Length and diameter ratios and hollow center data on 16 seedless picking cucumber varieties planted at the Saginaw Valley Research and Extension Center in 2018. No statistical analyses were performed on these variables.

Variety	Company	L:D Ratios				% Hollow Centers
		3B	3A	2B	2A	
RZ10	RZ	2.39	2.50	3.07	3.05	44.55
Liszt	RZ	2.45	2.60	3.09	2.83	28.31
Absolut	BE	2.53	2.76	3.11	2.70	54.90
RZ6	RZ	2.44	2.79	2.98	2.56	31.97
RZ8	RZ	2.68	2.91	3.28	3.39	27.84
Amarok	BE	2.32	2.49	2.46	2.89	51.84
RZ7	RZ	2.64	2.78	3.00	3.10	1.04
Aristan	BE	2.50	2.67	2.88	3.03	1.33
RZ11	RZ	2.56	2.63	3.05	3.09	19.57
Rubinstein	RZ	2.53	2.88	2.90	3.16	18.97
Bowie	RZ	2.59	2.67	2.94	3.35	90.28
Artist	BE	2.50	2.69	2.99	2.95	14.14
Gershwin	RZ	2.55	2.68	2.89	3.40	58.56
RZ9	RZ	2.44	2.68	2.75	3.10	10.63
Amour	BE	2.50	3.05	2.96	2.15	3.67
Ansor	BE	2.75	2.70	3.05	3.21	0.00
Mean	-	2.51	2.72	2.96	3.00	28.60
CV	-	4.24	7.05	9.28	17.01	93.64

Table 3. Averaged weekly weather data from the trial period (7 June – 25 July) taken from the Michigan Agricultural Weather Network station on site at the Saginaw Valley Research and Extension Center. Temperature is reported in Fahrenheit and precipitation is reported in inches. Air temperature was measured 5 ft off of the ground, and soil temperature was measured 2 inches below the soil surface.

Week	Max Air Temp	Min Air Temp	Max Soil Temp	Min Soil Temp	Precipitation
1	79.05	55.14	64.95	63.95	0.06
2	83.52	59.37	67.77	66.75	0.10
3	77.09	54.99	68.14	67.09	0.26
4	91.00	68.89	74.37	72.99	0.00
5	83.26	54.69	75.69	74.30	0.00
6	84.91	61.54	76.41	75.09	0.30
7	78.14	63.47	75.24	74.20	0.27
Mean	82.33	59.64	71.74	70.57	0.22
CV	7.86	12.28	6.33	6.29	116.12

2018 DRY BEAN YIELD TRIALS

J.D. Kelly, E.M. Wright and A. Wiersma
Plant, Soil and Microbial Sciences

The dry bean breeding program initiated its tenth season on the 450 acre Saginaw Valley Research & Extension Center (SVREC) research farm near Frankenmuth MI in 2018. The MSU dry bean breeding and genetics program conducted 23 yield trials in 2018 in ten market classes and participated in the growing and evaluation of the Cooperative Dry Bean, Midwest Regional Performance, National Drought and the National Sclerotinia Nurseries in Michigan and winter nursery in Puerto Rico. A total of 2870 bean plots were trialed in 2018, 1890 plots at SVREC, 516 plots at the Montcalm Research Center (MRC), and 464 plots at East Lansing. The nurseries at SVREC were planted in June 2018 into drier than normal soil moisture conditions, which continued through June and July. Bean trials received only 3.45" of rain during that 60-day period of June and July, which was confounded with high temperatures in excess of 90F. The plants were under considerable stress during this vegetative phase and recovered with substantial rainfall totals of 7.90" in August. Resulting yields were well above average with navy beans yielding 33 cwt/acre and black beans averaged 39 cwt/acre. MRF details and weather; Weather patterns followed a similar trend at MRC, but low rainfall amounts in June and July were offset with supplemental irrigation applied 10 times for a total of 5.4"during the course of the season. Despite the higher management, yields were average in 2018.Planting of the bean trials on the MSU Soils farm in East Lansing was delayed to June 26, due to the dry conditions. Rainfall in June (1.6") was followed by hot (90+F) and dry conditions in July (2.18"). Despite the unfavorable conditions early in the season, conditions improved in August (4.21") and the crop responded producing above average yields of 36 cwt/acre.

In 2017, anthracnose was observed in fields of Zenith black bean in Northern Michigan. Zenith is resistance to the current races 7 and 73 known to be present in Michigan. A disease survey was conducted across nine counties of the Michigan bean growing region and 39 infected pod samples were collected. Isolates were characterized for their reaction on twelve differential cultivars of *Phaseolus vulgaris*. Twenty-seven isolates were identified as Race 73 that commonly occurs when conditions are conducive for disease development. An isolate from western Michigan was identified as Race 7, which overcomes the Co-1 gene present in kidney beans. Six isolates from Northern Michigan were characterized as Race 109, previously reported in Manitoba, but not previously found in Michigan. Race 109 is virulent on the Co-1^2 gene possessed by Zenith, which previously conferred resistance to all known races found in Michigan. Due to the emergence of Race 109, KASP markers will be deployed to pyramid additional resistance genes such as Co-4^2, Co-5 and Co-6 genes into future dry bean cultivars. Race 109 anthracnose was detected in Zenith fields in 2018 in Alcona County, but the incidence was much lower than in 2017 as growers used preventative Priaxor spray and weather conditions were less favorable for development and spread in 2018. Anthracnose samples collected in 2018 will be race characterized over the winter.

The data for all tests are included in an attached section. Procedures and details on nursery establishment and harvest methods are outlined on the first page. Since the data collected on each test are basically the same, a brief discussion of each variable measured is presented below for clarification purposes.

1. Yield is clean seed weight reported in hundredweight per acre (cwt/acre) standardized to 18% moisture content. Dry beans are commercially marketed in units of 100 pounds (cwt).

2. Seed weight is a measure of seed size, determined by weighing in grams a pre-counted sample of 100 seeds, known as the 100-seed weight. To convert to seeds per 100g (10,000/100 seed wt); for example, 100-seed weight of 50 converts to 200 seeds per 100 g (used in marketing).

3. Days to flower are the number of days from planting to when 50% of plants in a plot have one or more open flowers.

4. Days to maturity are the actual number of days from planting until date when all the plants in a plot have reached harvest maturity.

5. Lodging is scored from 1 to 5 where 1 is erect while 5 is prostrate or 100% lodged.

6. Height is determined at physiological maturity, from soil surface to the top of plant canopy, and is recorded in centimeters (cm).

7. Desirability score is a visual score given the plot at maturity that takes into consideration such plant traits as; moderate height, lodging resistance, good pod load, favorable pod to ground distance, uniformity of maturity, and absence of disease, if present in the nursery. The higher the score (from 1 to 7) the more desirable the variety, hence DS serves as a subjective selection index.

At the bottom of each table, the mean or average of all entries in a test is given to facilitate comparisons between varieties. In order to better interpret data, certain statistical factors are used. The LSD value refers to the Least Significant Difference between entries in a test. The LSD value is the minimum difference by which two entries must differ before they can be considered significantly different. Two entries differing in yield by 1 cwt/acre cannot be considered as performing significantly different if the LSD value is greater than 1 cwt/ acre. Such a statement is actually a statement of "probable" difference. We could be wrong once in 20 times ($p=0.05$) on the average, depending on the level of probability. The other statistic, Coefficient of Variation (CV), indicates how good the test was in terms of controlling error variance due to soil or other differences within a location. Since it is impossible to control all variability, a CV value of 10% or less implies excellent error control and is reflected in lower LSD values. Under the pedigree column, all released or named varieties are **bolded** and always preceded by a comma (,); when preceded by a slash (/), the variety was used only as a parent to produce that particular breeding line.

Expt. 8101: Standard Navy Bean Yield Trial

This 48-entry trial included standard commercial navy bean varieties, and advanced lines from the MSU breeding program, which carry the N-prefix. Yields ranged from 27.8 to 37.1 cwt/acre with a mean of 33 cwt/acre. Variability in this trial was low (CV=8.9%) and the LSD needed for significance was 3.5 cwt/acre. However, only two new lines significantly out-yielded the test mean and the overall yields were disappointing low compared to those of black beans. Alpena was the top variety in the trial followed by Vigilant, and Merlin that grouped around the test mean. Similar to the past four years, Medalist was the lowest yielding variety and the low performance of Medalist results from severe leaf retention and failure to dry down. The inability of many varieties to mature uniformly was the result of the early drought stress resulting in the inability of the plants to set sufficient pod load (sink) to mature out normally. The yield potential in navy beans needs to be improved, as they are no longer competitive with black beans. Canning tests will be conducted on all new MSU breeding lines before being considered for advance.

Expt. 8102: Standard Black Bean Yield Trial

This 54-entry trial included the standard commercial black bean varieties and advanced breeding lines. Yields ranged from 33.1 to 44.5 cwt/acre with a test mean of 38.6 cwt/acre. Variability was low in this test, (CV=6.1%) and the LSD was 2.8 cwt/acre. Seven entries significantly outyielded the test mean and they included B16504 for the third consecutive year. The top entry, B18504 is an anthracnose (race 109) resistant selection out of B16504 that appears to perform equivalently. All other varieties, Black Bear, Zorro, Black Tails and Eclipse yielded below the test mean. ACUG 15-B4 and Eclipse were the lowest yielding entries in the test. Canning tests will be conducted on new breeding lines to ensure only those with canning quality similar to Zenith are advanced.

Expt. 8103: Black Bean Yield Trial #2

This 84-entry trial included recombinant inbred lines (RILs) developed by crossing Zenith with advanced black bean breeding lines, B12724, B14311and B14302 and inbreeding the progeny over several generations. This experiment was designed to determine the combining ability of different black beans that are known to possess excellent color retention when canned. Yields ranged from 31.7 to 45.9 cwt/acre, with the test mean of 40.1 cwt/acre. Variability was low (CV=6.3%), resulting in a LSD of 3.4 cwt/acre. Eleven lines significantly outyielded the test mean and included the two lines B18504 and B16504. Zenith was the top commercial check, followed by Black Tails, Zorro, Black Bear and Eclipse was the lowest yielding entry similar to test 8102. The entire RIL population was canned last year, and most lines maintained a dark black color after canning, some being darker than Zenith. Lines will be selected for this year's canning tests based on yield, agronomic, and previous canning data. Some actual plot yields in this trial exceeded 50 cwt/acre indicating the yield superiority of black beans over other commercial classes. These high yields were significant given the severe drought and heat stress conditions experienced early in 2018.

Expt. 8104: Preliminary Black Bean Yield Trial

This 48-entry trial included new black bean lines (B18-prefix) and check varieties. Yields ranged from 33.6 to 45.5 cwt/acre with a mean of 40.2 cwt/acre. Variability was well controlled in this 3-

rep test (CV=6.3%) and the LSD was 3.5 cwt/acre. Nine lines significantly outyielded the test mean. Zenith (43.0 cwt) outyielded Zorro (40.7 cwt) and Black Bear (40.2 cwt) as in tests 8102 and 8103. Many of the lines in this trial carry anthracnose resistance in addition to improved levels of CBB resistance but future advances of any new breeding lines will largely depend on confirmation of disease reactions and canning quality of the entries.

Expt. 8105: Standard Great Northern Yield Trial

This 42-entry trial included MSU great northern breeding lines (G-prefix) and standard commercial check varieties. The test ranged in yield from 25.6 to 36.4 cwt/acre with a mean yield of 31.4 cwt/acre. Variability was moderate (CV= 10.6%) resulting in a LSD value of 3.9 cwt/acre needed for significance. Six entries significantly outperformed the test mean and included G16351 line consistent performer over the last 3-years. The top entry G17410 was the top entry in 2017 but the line matures later exhibits undesirable severe green stem trait at maturity. The checks included Powderhorn and two varieties, Taurus and Aries from Nebraska. The NE varieties lodge more and are very susceptible to white mold. Many of the new lines have smaller seed (<40 g) and will need to be selected on that basis.

Expt. 8106: Standard Otebo Yield Trial

This 24-entry trial included MSU otebo breeding lines (G-prefix) and standard commercial check varieties. The test ranged in yield from 32.7 to 45.2 cwt/acre with a mean yield of 38.4 cwt/acre. Variability was moderate (CV= 9.8%) resulting in a high LSD value of 4.4 cwt/acre needed for significance. As a result, only one new entry G18904 significantly outperformed the test mean. The check variety Samurai is an upright type suitable for direct harvest and is comparable in yield to current upright black and navy bean varieties. Seed size of Samurai (31g) is considered too small by industry, as otebo beans are graded over 11/64 slotted screen. Most of the G17-, G18- entries, derived from crosses with Samurai possess small seed size, and only two entries had seed size larger than Samurai. The majority of entries carry resistance to races 73 and 109 anthracnose. Future breeding of otebo beans is being suspending due to inflexibility in the marketplace.

Expt. 8107: Standard Pinto Bean Yield Trial

This 36-entry trial included MSU pinto lines (P-prefix) and standard commercial check varieties. The test ranged in yield from 25.0 to 39.7 cwt/acre with a mean yield of 32.4 cwt/acre. Variability was moderate (CV= 11.9%) resulting in a LSD value of 4.5 cwt/acre needed for significance. Seven entries significantly outperformed the test mean and included P16901 the top entry in 2017. Checks included standards Eldorado, La Paz and slow dark pintos Palomino, DR Wood and Staybright. Many of the higher performing SDP H/H (slow dark pinto) from MSU had undesirable agronomic traits, such as leaf retention and green stem. The emphasis on incorporating the slow dark trait into pinto beans appears to be bringing along negative traits that are negatively impacting yield due to genetic linkage drag. To overcome linkage drag, F3 lines expressing the slow dark trait were topcrossed with elite germplasm in the 2018 crossing block. The future of traditional pinto bean seed types in the marketplace is uncertain complicating future breeding efforts in this seed class.

Expt. 8108: Standard Small Red and Pink Bean Yield Trial

This 36-entry trial included small red and pink breeding lines from MSU (R-small red; S-pink prefix), in addition to standard commercial check varieties. The test ranged in yield from 34.1 to 48.8 cwt/acre with a mean yield of 40.9 cwt/acre. Variability was moderate (CV=6.9%) resulting in a LSD value of 3.3 cwt/acre for significance. The top seven lines included a series of new red (R18-) and pink S18-lines that tended to be later maturing and less erect. All checks and older lines yielded less. Three sib-lines (R17603, R17604, and R17605) that have outstanding architecture, and performed well in 2017, fell below test mean in 2018. Rosetta was the top variety followed by Viper, Cayenne and Merlot, lowest yielding entry. As in past years, seed size of Viper (34g) is significantly smaller than that of Merlot (43g) and Cayenne (39g). Progress in pink and small red breeding programs has been limited by a lack of useful variability and inability to combine performance with upright architecture and suitable canning quality in new lines. All new lines will be evaluated for canning quality and BCMV reaction prior to advancing to 2019 trials.

Expt. 8109: Combined Midwest Regional Performance Nursery (MRPN) & Cooperative Dry Bean Nursery (CDBN) Yield Trial

The MRPN is conducted annually in cooperation with North Dakota (ND-prefix), Nebraska (NE-prefix) and Colorado (CO-prefix) in order to test new pinto, great northern and small red lines from all four programs and assess their potential in the different regions. The CDBN is a national trial and includes all classes but only medium-sized entries were included in this trial. The 36-entry trial ranged in yield from 25.7 to 42.9 cwt/acre with a mean of 33.8 cwt/acre. Variability was low (CV=8.9%) resulting in a LSD value (4.1 cwt/acre) for significance. As a result, 11 lines were significantly higher in yield than the test mean including varieties Cayenne, La Paz and Merlot. In the top group were pinto, PT16-17, and pink PK16-7 from USDA-WA, small red R17604 from MSU and new slow dark pinto release NE2-17-18 (PTO 2) from NE. Performance of other slow darkening pintos Palomino from NDSU was below average. Two new releases from NE, pinto NE2-17-39 (PTO 7) and GN NE1-17-10 (GN 12) significantly under performed. This cooperative trial continues to be valuable as it allows an evaluation of potential new lines prior to release in other states. Canning quality will also be evaluated for all entries.

Expt. 8110: Cooperative Dry Bean Nursery (CDBN) Classic Yield Modelling Trial

This trial was organized to test theory of genomic selection based on CDBN data collected over decades across the US. The study was coordinated out of the University of Texas, Austin and was grown across the US. The 10-entry trial ranged in yield from 16.3 to 30.2 cwt/acre with a mean of 24.0 cwt/acre. Variability was low (CV=6.0%) resulting in a LSD value (2.0 cwt/acre) for significance. As a result, four lines were significantly higher in yield than the test mean including pinto varieties ND-307 and Buster. Yolano pink, Starlight GN and Aztec pinto all underperformed. Based on genomic selection model, five entries were low yielding and five were high yielding. All entries were released over 10-15 years ago and the overall low yield reflected the substantial progress that has been made in breeding over that time period. In comparing means with previous CDBN test 8109 that averaged 33.8 cwt/acre compared to 24 cwt/acre for test 8110. None of the entries reached the average of test 8109, which puts in question the potential value of genomic selection versus real world phenotypic selection based on actual yield data.

Expt. 8111: Middle American Diversity Panel – Race Mesoamerica
Expt. 8112: Middle American Diversity Panel – Race Durango

These two trials were single plot grow outs to renew seed of the Middle American Diversity Panel (MDP). The panel was split into two races – small seeded race Mesoamerica that includes navy and black beans; and medium seeded race Durango that includes pinto and great northern, red and pink beans. Test 8111 included 96-entries and test 8112 included 204-entries. Seed source was 2011 field seed and germination was more problematic in race Durango lines than in the small seeded Mesoamerican entries. No actual data was collected on the trials, but seed was renewed and is available for collaborative projects with colleagues in the Plant Resilience Institute (PRI).

Expt. 8113: National Dry Bean Drought Nursery

This 32-entry trial was conducted at the SVREC to evaluate a series of breeding lines identified through shuttle breeding between University Nebraska and USDA-TARS station in Puerto Rico as possessing improved levels of drought stress. The trial was replicated by colleagues at various locations across the US. Yields ranged from 14.9 to 44.2 cwt/acre with a mean of 30.9 cwt/acre. Variability was moderate (CV=10.5%) and the LSD needed for significance was 4.4 cwt/acre. Seven lines significantly out-yielded the test mean, including varieties Cayenne, Zenith, and new pinto from Colorado, DR Wood. The top entry was MSU black bean line B16504 followed by pinto PT from USDA-WA. As in 2017, Blackfoot was the lower yielding entry next to Marquis GN. Since drought was a factor in 2018, it was gratifying to see that new MSU varieties were in the top group. This suggests that continued selection for high performance under local precipitation patterns has resulted in materials that exhibit improved performance under stressful conditions.

Expt. 8214: Standard Kidney Bean Yield Trial

This 56-entry trial was conducted on original trial ground on the Montcalm Research Farm (MRF) to compare the performance of standard and new light red kidney (LRK), dark red kidney (DRK), white kidney (WK), varieties from MSU and CDBN under supplemental irrigation (10x total 5.4”). A prominent feature of this trial was lack of root rot disease pressure as noted in past years and lack of deer feeding due to erection of a deer fence. Yields ranged from 19.1 to 33.1 cwt/acre with a mean of 26.2 cwt/acre. Variability was moderate (CV=12.7%) resulting in a LSD value of 4.5 cwt/acre needed for significance. Only two entries significantly out-yielded the test mean, included new WK K17209 and LRK K15601 under consideration for release. Check varieties Dynasty, Chaparral, Snowdon, Inferno and Clouseau were above the test mean, while Beluga and Red Cedar were equivalent to test mean and Yeti, CELRK, Big Red, Talon, Red Hawk, Rosie, and Montcalm fell below the mean. These results provide a comparison of all current red and white kidney bean varieties.

Expt. 8215: Standard Yellow Bean Yield Trial

This 24-entry trial was conducted on new ground at MRF to compare the performance of new yellow bean lines from MSU under supplemental irrigation (10x total 5.4”). This is the first yellow bean trial conducted with MSU lines (Y-prefix) and new varieties from programs in the US and Canada (AAC). Yields ranged from 17.4 to 29.5 cwt/acre with a mean of 22.6 cwt/acre. Variability

was moderate (CV=11.6%) resulting in a LSD value of 3.1 cwt/acre needed for significance. Only four lines significantly outyielded the test mean and these included the private variety SVS-0863, three lines from the MSU program. This is the second year of testing new yellow bean lines from MSU that all carry I-gene resistance to BCMV. The AAC lines from Canada are susceptible to BCMV as is SVS-0863 and MY 06326. Performance of the new Patron variety, its sib (DBY-28-1), and AAC Y012 from Canada was much lower than in 2017, due in large part to greater lodging and resulting white mold infection in 2018. These results are initial efforts to breed adapted yellow beans and retain the strong yellow (highlighter) seed color of the Mexican Peruano, Azufrado, Mayacoba seed types. The virus resistance in all new lines will be verified and the lines will be canned before being advanced in 2019.

Expt. 8216: Preliminary Kidney Bean Yield Trial

This 48-entry trial was conducted to compare the performance of new kidney bean lines from MSU grown under supplemental irrigation (10x total 5.4"). Yields ranged from 19.6 to 31.2 cwt/acre with a mean of 25.4 cwt/acre. Variability was moderate (CV=11.3%) in this 3-rep experiment resulting in a LSD value of 3.9 cwt/acre needed for significance. Seven lines significantly outyielded the test mean and these include all new K18-lines while Snowdon topped the trial. The top group included two half-sibs WK, one DRK and two LRK lines. A number of new WK lines have an indeterminate growth habit that growers may not favor, but appear to provide greater resilience and better performance coupled with earliness. Since canning quality is vital in kidney beans, only those lines equivalent in canning quality to check varieties will be advanced in 2019.

Expt. 8217: Iowa State Yield Trial

This is the second year to plant this small 4-entry trial was a collaboration with Iowa State University who were evaluating four contrasting bean types at a number of locations across the US to determine the effects of location on mineral element content of the seed. The four varieties were the yellow bean MY 06326, Taurus great northern, Eclipse black and Montcalm DRK. Yields ranged from 23.0 to 42.4 cwt/acre with a mean of 30.7 cwt/acre. Variability was well controlled (CV=5.3%) resulting in a LSD value of 2.6 cwt/acre needed for significance. Only Eclipse black bean significantly outyielded the test mean with highest yield on the farm. MY 06326 is a private variety licensed by the Kelley Bean Company and bred by Provita, but it is susceptible to BCMV; Taurus is a great northern variety from Kelley Bean in NE. Seed will be send to ISU for nutrient analysis as part of a graduate student thesis project.

Expt. 8218: National White Mold Yield Trial

This 32-entry trial was conducted to evaluate a range of diverse dry bean varieties and breeding lines for reaction to white mold under natural field conditions. Genotypes included commercial navy and black bean cultivars, elite MSU lines, and new sources of white mold resistance entered as part of the National *Sclerotinia* Initiative (NSI) Nursery. Lines in the National trial were developed at MSU, USDA-WA, and NDSU and one line, ND121448 from NDSU did not germinate. Entries were planted in two row plots with two rows of susceptible spreader variety Matterhorn between plots and were direct harvested. Supplemental overhead irrigation was applied 17 times for a total of 7.8" to maintain adequate levels of moisture for favorable disease

development at the critical flowering period. The trial was planted on original bean land previously infected with white mold. Natural white mold infection occurred, and was very severe on both spreader rows and check varieties. White mold was rated on a per plot basis on a scale of 1 to 9 based on disease incidence and severity where 9 had 90+% incidence and high severity index. White mold ranged from 22.2 to 96.3% with a mean value of 51%. The susceptible check Beryl had the highest white mold rating. The test ranged in yield from 7.4 to 36.1 cwt/acre with a mean yield of 25.1 cwt/acre. Variability was moderate (CV=12.8%), thus a high LSD value (4.4 cwt/acre) was needed for significance. Nine lines significantly out-yielded the test mean and included Viper, despite heavy white mold infection (78%), and two new R17-red lines, two new P16-pinto lines and two black lines including B16504. Stand ability was a key trait in avoiding white mold in this trial and new line B18504 tended to lean due to heavy pod load and contracted higher white mold levels as a result. The trade off in erectness versus yield (pod load) is a major factor in avoidance of white mold. This trial will continue to be part of the breeding effort to improve tolerance to white mold in future varieties in 2019.

Expt. 8419: Phaseolus Improvement Cooperative (PIC) Observation Trial

As part of the focus of the Plant Resilience Institute (PRI) we requested 96 PIC lines (90 lines and 6 local checks) from Dr. Timothy Porch USDA-ARS, Mayaguez PR for testing in MI. These lines are mainly large seeded kidney, cranberry and yellow lines that have be bred for tolerance to heat stress. We wanted to determine their adaptation to MI conditions as most originate from crosses with tropical germplasm from South America and East Africa. The lines were planted late (June 26) in single paired row plots (50 seeds), with a common border in East Lansing on the Soils Farm. Data was collected on maturity, height, lodging, seed size and yield (1-rep). Yields were surprising good ranging from zero (9 unadapted lines), from 11.9 to 45.4 cwt/acre. Top yielding check variety was Red Cedar (42.9 cwt), followed by Etna (35.5 cwt), Clouseau (34.5 cwt), Snowdon (33.1 cwt), Red Hawk (31.8 cwt), and CELRK (11.9 cwt/acre). Seed was rated based on commercial value and the best lines were selected as parents for crossing to broaden the genetic base of local kidney, cranberry and yellow bean classes. A copy of the data is publically available to anyone interested in seeing the actual data (1-rep expt).

Expt. 8420: Yield Differential Index – Fertilized
Expt. 8422: Yield Differential Index – No Fertilizer

These two trials were each 26-entry trials with two replicates and were conducted on land in East Lansing that is managed by the MSU agronomy farm. The objective of the trials was to determine the yield difference index between plots with and without N fertilizer. At planting, the fertilizer treatment of 46 lb N/acre was broadcast as 100 lb Urea, using a hand-crank fertilizer spreader. Yields of the fertilized treatment ranged from 29.9 to 43.2 cwt/acre with a mean of 36.4 cwt/acre. The variability in fertilized treatment was moderate (CV=7.5%) and the LSD needed for significance was 4.7 cwt/acre. Yields of the non-fertilized treatment ranged from 25.2 to 39.0 cwt/acre with a mean of 31.7 cwt/acre. The variability in the non-fertilized treatment was moderate (CV=8.7%) and the LSD needed for significance was 4.7 cwt/acre. On average, fertilized plots had 4.7 cwt/acre higher seed yield compared to non-fertilized plots. The moderate level of variability and elevated LSD values can be attributed to low replications (2-reps per genotype x treatment). Besides improving yield potential, the fertility did not have any apparent effects on

seed weight, anthesis date, maturity, lodging, plant height, or desirability score. In both trials, the black bean line B16504 demonstrated the highest yield potential. Surprisingly, B18504 performed well with nitrogen fertilizer but had yield equivalent to the trial mean in the non-fertilized treatment. Comparison of average seed yield and % yield relative to the fertilized control revealed that 11 lines yielded 90 to 106% relative to the fertilized control. However, with the exception of B16504 all lines with ≥ 90% yield relative to the fertilized control had commercially unacceptable yield potential (Figure 1). The preliminary data produced in this study is encouraging and has motivated us to pursue Project GREEEN funding for a larger scale black bean trial at SVREC in 2019.

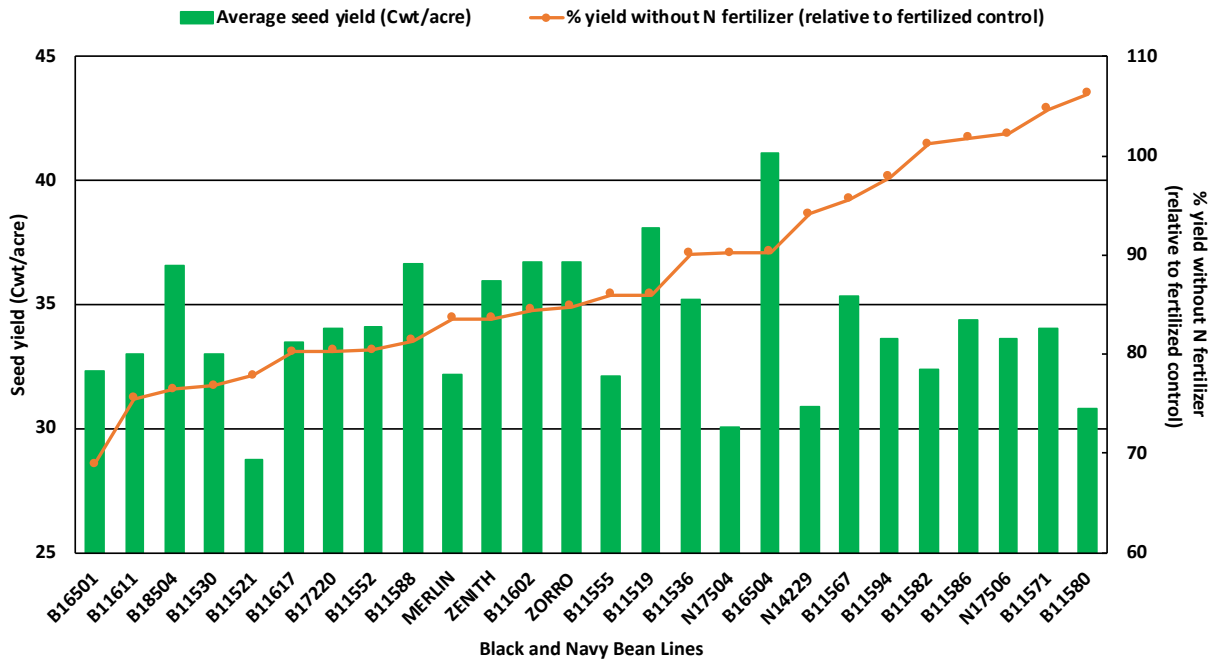

Figure 1. Comparison of average yield and % yield relative to fertilized control of 26 black and navy bean lines tested in East Lansing, MI.

Expt. 8421: Black Bean RIL Population – No Fertilizer No Inoculant Trial
Expt. 8423: Black Bean RIL Population – No Fertilizer with Inoculant Trial

These two trials were each 132-entry trials with no replication and were conducted on land in East Lansing that is managed by the MSU agronomy farm. The objective of the trials was to isolate rhizobium from nodules of inoculated and non-inoculated RILs for QTL/linkage mapping of host traits responsible for the recruitment of specific rhizobium species and strains. Seed of the inoculated trial was treated with a peat-rhizobium mixture in which equal proportions of 9 rhizobia liquid cultures (obtained from USDA) where sprayed onto the peat. Unfortunately, we suspect that unusually dry and hot weather conditions inhibited nodule formation. Rather than expending additional resources, we decided to terminate the experiment. Seed from Expt. 8421 was harvested to replenish the RIL population seed supply. Following additional growth chamber and greenhouse studies in 2019, a similar experiment may eventually be repeated.

Expt. 8124: Black Bean Seed Treatment Trial

This trial was conducted at SVREC and MRF under irrigation to test the efficacy of Excalibre inoculant applied as a seed treatment on Zenith black bean. The yields at SVREC ranged from 44.1 to 45.6 cwt/acre with a mean of 45.1 cwt/acre. The variability at SVREC was low (CV=4.3%) and the LSD needed for significance was 2.0. The yields at MRF ranged from 27.1 to 35.1 cwt/acre with a mean of 30.7 cwt/acre. The variability at MRF was higher (CV=9.4%) and the LSD needed for significance was 2.9. The Excalibre treatment had no significant or apparent effects on yield at SVREC or 100 seed weight at both locations. However, Zenith treated with Excalibre had significantly higher (6.5 cwt/acre) seed yield compared to Zenith without the Excalibre treatment. Excalibre is a rhizobia inoculum that was developed to promote nodulation and nitrogen fixation. Based on previous reports, it is clear that water deficiencies can significantly reduce nodulation in dry bean (Mnasri et al. 2007). We suspect that low soil moisture at SVREC inhibited nodulation, while irrigation at MRF promoted the effects of Excalibre. Additional studies are needed to validate these results.

Source: Mnasri B, Aouani ME, Mhamdi R. 2007. Nodulation and growth of common bean (*Phaseolus vulgaris*) under water deficiency. Soil Biology and Biochemistry 39:1744-1750.

Entry	Seed Treatment	Yield cwt/acre		100 seed weight (g)	
		SVREC	**MRF**	**SVREC**	**MRF**
B18504	Cruiser	45.6	35.1	23.7	24.0
Zenith	Cruiser + Excalibre	45.5	33.6	26.4	24.3
Zenith	Cruiser	45.0	27.1	26.8	24.3
Zenith	Bare	44.1	27.1	26.1	23.8
Mean		45.1	30.7	25.8	24.1
LSD. 05		2.0	2.9	0.8	0.8
CV %		4.3	9.4	3.0	3.1

Early Generation Breeding Material grown in Michigan in 2018

F3 through F5 lines
Navy and Black - 212 lines
Pinto - 75 lines
GN - 76 lines
Pinks and Reds – 20 lines
Kidneys (DR, LR, White) - 337 lines
Yellow – 43 lines

F2 populations
Navy and Black -218 populations
Pinto - 82 populations
GN & Tebo - 91 populations
Pinks and Reds - 42 populations
Kidneys (DR, LR, White) - 55 populations
Yellow – 22 populations

F1 populations: 529 different crosses among ten contrasting seed types.

2018 DRY BEAN YIELD TRIALS

Experiment	Title	Planting Date	Location	Entries	Design	Reps	Harvest Method
8101	STANDARD NAVY BEAN YIELD TRIAL	6/1/2018	SVREC	48	ALPHA LATTICE	4	DIRECT
8102	STANDARD BLACK BEAN YIELD TRIAL-1	6/1/2018	SVREC	54	ALPHA LATTICE	4	DIRECT
8103	STANDARD BLACK BEAN YIELD TRIAL-2	6/1/2018	SVREC	84	ALPHA LATTICE	3	DIRECT
8104	PRELIMINARY BLACK BEAN YIELD TRIAL	6/1/2018	SVREC	48	REC. LATTICE	3	DIRECT
8105	STANDARD GREAT NORTHERN BEAN YIELD TRIAL	6/4/2018	SVREC	42	REC. LATTICE	4	DIRECT
8106	STANDARD TEBO BEAN YIELD TRIAL	6/4/2018	SVREC	24	ALPHA LATTICE	4	DIRECT
8107	STANDARD PINTO BEAN YIELD TRIAL	6/4/2018	SVREC	36	SQ. LATTICE	4	DIRECT
8108	STANDARD RED AND PINK BEAN YIELD TRIAL	6/4/2018	SVREC	36	SQ. LATTICE	4	DIRECT
8109	MIDWEST AND CO-OP REGIONAL TRIAL	6/4/2018	SVREC	36	SQ. LATTICE	3	DIRECT
8110	CDBN CLASSIC-YIELD MODELING TRIAL	6/4/2018	SVREC	10	RCBD	3	DIRECT
8111	MIDDLE AMERICAN DIVERSITY PANEL -RACE MESOAMERICAN	6/4/2018	SVREC	96	ALPHA LATTICE	1	DIRECT
8112	MIDDLE AMERICAN DIVERSITY PANEL -RACE DURANGO	6/4/2018	SVREC	204	ALPHA LATTICE	1	DIRECT
8113	NATIONAL DRYBEAN DROUGHT YIELD TRIAL	6/4/2018	SVREC	32	ALPHA LATTICE	3	DIRECT
8214	STANDARD KIDNEY BEAN YIELD TRIAL	6/12/2018	MRF	56	REC. LATTICE	3	ROD PULLED
8215	STANDARD YELLOW BEAN YIELD TRIAL	6/12/2018	MRF	24	ALPHA LATTICE	4	ROD PULLED
8216	PRELIMINARY KIDNEY BEAN YIELD TRIAL	6/12/2018	MRF	48	REC. LATTICE	3	ROD PULLED
8217	SEED NUTRIENT TRIAL-IA STATE	6/12/2018	MRF	4	RCBD	3	ROD PULLED
8218	NATIONAL WHITE MOLD YIELD TRIAL	6/12/2018	MRF	32	ALPHA LATTICE	3	DIRECT
8419	PHASEOLUS IMPROVEMENT CO-OP (PIC) OBSERVATION TRIAL	6/26/2018	EL	96	RCBD	1	HAND PULLED
8420	YIELD DIFFERENTIAL INDEX TRIAL-WITH FERTILIZER	6/26/2018	EL	26	RCBD	2	DIRECT
8421	PUEBLA/ZORRO RILS-NO FERTILIZER OR INOCULANT	6/26/2018	EL	132	RCBD	1	HAND PULLED
8422	YIELD DIFFERENTIAL INDEX TRIAL-NO FERTILIZER	6/26/2018	EL	26	RCBD	2	DIRECT
8423	PUEBLA/ZORRO RILS-NO FERTILIZER, WITH INOCULANT	6/26/2018	EL	132	RCBD	1	

PROCEDURE: PLANTED IN 4 ROW PLOTS, 20 FEET LONG, 20 INCH ROW WIDTH, 4 SEEDS/FOOT, 15 FOOT SECTION OF CENTER 2 ROWS WAS HARVESTED AT MATURITY.

SVREC-FRANKENMUTH: FERTILIZER BROADCAST: 400# OF 15-5-13 + S, ZN,MN,CU PRIOR TO PLANTING.
HERBICIDES APPLIED: 1.0 PT DUAL + 1.25 QT EPTAM APPLIED PPI.

MRF-ENTRICAN: FERTILIZER BROADCAST: 200# OF 19-10-19 PRIOR TO PLANTING. 100# 46-0-0 SIDE DRESSED ON JULY 11.
HERBICIDES APPLIED: 1.0 QT DUAL + 1.25 QT EPTAM + 1.0 QT SONOLAN APPLIED PPI. 4 OZ. RAPTOR + 13 OZ. REFLEX + 1 PT. BASAGRAN ON JULY 6.

EL-EAST LANSING: FERTILIZER BROADCAST:100# OF 46-0-10 PRIOR TO PLANTING ON TRIAL 8419 & 8420.
HERBICIDES APPLIED: 1.0 QT DUAL + 1.25 QT EPTAM + 1.0 QT SONOLAN APPLIED PPI.

EXPERIMENT 8101 STANDARD NAVY YIELD TRIAL								PLANTED: 6/1/18	
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**
N18116	N14201/N15334	33	37.1	20.8	52.0	102.0	2.0	52.5	5.0
N18126	N15335/N14238	43	37.0	21.0	49.0	100.0	1.0	53.5	6.0
N18117	N14201/N15334	34	36.3	19.6	51.0	103.0	1.5	54.0	5.5
N18112	N13131/B14302	29	36.2	22.9	49.0	100.0	1.0	50.5	5.0
N18102	N13120/I15617	19	36.0	22.5	48.0	100.0	1.5	51.5	6.0
N11283	MEDALIST/N08003, **ALPENA**	16	35.5	22.1	47.0	103.0	2.0	49.0	4.0
I18630	**NA 14068**	14	35.5	26.6	47.0	104.0	2.0	55.0	4.5
N17506	N14230/N12447	4	35.4	21.7	48.0	100.0	1.0	52.5	5.5
N18127	N14201/N13131	44	35.0	19.2	47.0	99.0	1.0	51.5	5.0
N15337	N12466/N11258	8	34.7	20.3	49.0	99.0	1.5	50.5	5.0
N18119	N14218/N15341	36	34.6	20.0	50.0	100.0	1.5	52.5	5.0
N18118	N14201/N15334	35	34.6	20.2	51.0	102.0	1.5	53.0	6.0
N18104	N13131/N14201	21	34.4	21.8	48.0	101.0	2.0	52.0	5.0
N18109	N13131/B14302	26	34.4	23.2	47.0	101.0	1.0	51.5	5.5
N17505	N14230/N12447	10	34.3	22.3	48.0	99.0	1.0	53.0	6.0
N15306	N11230/N11298	13	34.2	20.8	47.0	101.0	2.0	50.0	5.0
N18122	N15334/N15335	39	34.0	23.0	48.0	101.0	1.0	55.0	6.5
N18113	N13131/B14302	30	33.8	22.2	49.0	100.0	1.0	52.0	5.5
N18128	N15341/N14238	45	33.8	23.4	48.0	99.0	1.0	54.0	6.0
N18105	N13131/N14201	22	33.7	20.6	49.0	100.0	1.5	51.5	5.0
I10101	COOP 02084, **VIGILANT**	12	33.3	23.3	47.0	100.0	1.0	53.0	5.0
N14230	N11275/N11256	2	33.3	18.7	48.0	99.0	1.5	52.5	5.5
I11264	COOP 03019, **MERLIN**	3	33.1	21.7	48.0	105.0	2.0	48.5	4.0
N18130	N15341/N14238	47	33.1	22.0	50.0	98.0	1.5	53.5	5.5
N18110	N13131/B14302	27	33.0	23.8	48.0	100.0	1.0	50.0	5.0
N18115	N13142/B14302	32	33.0	19.5	50.0	99.0	2.5	47.0	3.5
N18125	N15335/N14218	42	32.9	20.0	49.0	97.0	1.0	51.0	5.0
N18103	N13120/I15617	20	32.8	23.7	47.0	99.0	1.0	51.5	5.5
N18101	N13120/I15617	18	32.7	24.0	47.0	97.0	1.5	49.5	4.5
N18131	N15335/N13142	48	32.6	19.3	49.0	97.0	1.5	51.0	5.0

EXPERIMENT 8101 STANDARD NAVY YIELD TRIAL								PLANTED: 6/1/18	
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**
N18129	N15341/N14238	46	32.5	21.2	48.0	98.0	1.0	48.5	4.5
N17504	N14206/N14229	5	32.4	20.3	48.0	98.0	1.5	51.0	5.5
N18108	N13131/B14302	25	32.2	21.8	48.0	99.0	1.0	52.5	5.5
N14201	N11249/N11256	11	32.1	20.6	49.0	99.0	1.0	51.5	5.5
N18120	N14238/N14229	37	32.1	20.7	48.0	99.0	1.0	51.0	5.0
N18121	N14238/N14230	38	32.0	19.4	48.0	101.0	1.5	54.0	4.5
N18106	N13131/N14238	23	31.7	22.3	48.0	98.0	1.5	50.0	5.0
N18114	N13142/N13120	31	31.6	23.1	48.0	100.0	1.5	49.5	5.0
N14229	N11275/N11256	1	31.3	18.2	51.0	98.0	1.5	52.0	5.0
N18111	N13131/B14302	28	31.3	20.9	49.0	97.0	2.0	49.5	5.0
N18107	N13131/N14238	24	30.8	22.1	47.0	99.0	1.0	50.0	5.0
N18124	N15335/N14201	41	30.3	19.5	48.0	97.0	1.0	49.0	4.5
N14218	N11256/N11298	6	30.3	20.3	50.0	100.0	1.5	50.0	5.0
N17508	Alpena/N14229	7	29.8	19.1	48.0	98.0	1.0	52.0	6.0
N16405	N12466/N11264	15	29.4	24.7	48.0	98.0	1.5	48.5	4.0
N15313	N11258/N11277	9	28.4	19.4	47.0	97.0	2.0	48.0	4.0
N18123	N15335/N14201	40	27.9	19.0	48.0	98.0	1.0	51.0	5.0
I08958	Mayflower/Avanti, **MEDALIST**	17	27.8	22.0	47.0	105.0	2.5	50.0	4.0
MEAN(48)			33.0	21.3	48.2	99.5	1.4	51.3	5.1
LSD(.05)			3.5	1.0	1.1	1.7	0.7	1.7	0.7
CV%			8.9	4.0	1.3	1.0	28.1	2.0	8.0

EXPERIMENT 8102 STANDARD BLACK YIELD TRIAL (1)								PLANTED: 6/1/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
B18504	Zenith//Alpena*/B09197	50	44.5	23.3	48.0	102.0	1.0	52.0	6.0
B16504	Zenith//Alpena*/B09197	1	43.5	22.9	47.0	102.0	1.0	52.5	6.0
B15447	B11363/Zenith	3	43.3	25.0	48.0	102.0	1.0	52.0	5.0
B17315	B10244/B12724	24	43.0	22.9	49.0	101.0	1.5	51.5	5.0
B17271	B10244/B12724	27	42.0	25.5	47.0	99.0	1.5	50.0	4.5
B17293	B10244/B12724	25	41.7	25.0	47.0	99.0	2.0	50.0	4.5
B10244	B04644/ZORRO, **ZENITH**	16	41.5	26.2	47.0	102.0	1.0	52.5	5.0
B17207	B10244/B12724	46	41.3	23.4	48.0	99.0	1.0	52.5	5.0
B17286	B10244/B12724	37	41.2	25.1	47.0	99.0	1.0	49.0	4.0
B17265	B10244/B12724	43	41.0	24.4	48.0	99.0	1.0	51.5	4.5
B15427	Zenith/B11343	11	41.0	27.3	48.0	99.0	1.0	53.5	5.0
B17202	B10244/B12724	20	41.0	23.2	48.0	101.0	2.5	49.0	4.0
B16501	Zenith/B10215	5	41.0	25.4	48.0	100.0	1.0	52.0	5.0
B17260	B10244/B12724	31	40.4	24.4	47.0	101.0	2.0	49.5	4.0
B15430	Zenith/B12721	2	39.9	26.1	47.0	98.0	1.5	52.0	5.5
B17298	B10244/B12724	42	39.9	22.9	48.0	98.0	1.0	50.5	5.0
B17269	B10244/B12724	23	39.6	25.5	48.0	100.0	1.0	53.5	5.5
B15453	B11371/B11363	9	39.3	24.1	47.0	100.0	1.0	53.5	6.0
B17317	B10244/B12724	44	39.2	25.9	48.0	100.0	2.0	50.5	4.5
B17237	B10244/B12724	49	39.0	22.2	48.0	103.0	1.5	50.0	4.5
B17290	B10244/B12724	28	39.0	24.8	47.0	97.0	1.5	47.0	3.5
B17305	B10244/B12724	32	39.0	26.5	48.0	100.0	1.5	50.5	4.5
B17259	B10244/B12724	35	38.9	24.8	48.0	100.0	1.5	52.0	5.5
B16505	B11363//Alpena*/B09197	13	38.7	24.0	47.0	98.0	1.0	50.5	5.5
B15434	Zenith/B12721	6	38.6	24.5	48.0	100.0	1.0	55.0	6.0
B17214	B10244/B12724	39	38.6	26.6	48.0	100.0	2.0	49.5	4.0
B16503	Zenith/B12720	12	38.4	24.3	49.0	99.0	1.0	51.0	5.0
B17262	B10244/B12724	38	38.4	24.0	47.0	102.0	1.0	53.0	5.5
B15417	B10208/B09175	8	38.3	26.4	48.0	102.0	1.0	51.5	5.5
B15451	B11371/B11363	10	38.2	23.6	49.0	101.0	1.0	53.5	6.0

EXPERIMENT 8102 STANDARD BLACK YIELD TRIAL (1)								PLANTED: 6/1/18	
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**
B17306	B10244/B12724	33	38.2	24.4	47.0	101.0	2.0	49.5	4.0
B17328	B10244/B12724	22	38.0	26.1	47.0	99.0	2.5	48.0	4.0
B17280	B10244/B12724	41	38.0	25.4	47.0	99.0	1.0	54.0	5.0
B17340	B10244/B12724	34	38.0	24.3	48.0	99.0	2.0	50.5	4.5
B17220	B10244/B12724	19	37.9	25.6	48.0	101.0	1.0	55.0	5.5
B17255	B10244/B12724	26	37.8	24.2	49.0	102.0	2.0	50.5	4.5
B17112	B14304/B10244	15	37.6	23.1	48.0	99.0	1.0	51.0	5.5
B15411	B09175/B11363	4	37.5	22.5	47.0	99.0	1.0	51.0	5.0
B17274	B10244/B12724	47	37.5	23.9	47.0	99.0	1.5	50.5	4.5
B17225	B10244/B12724	48	37.5	22.8	47.0	98.0	2.0	48.0	4.0
I17501	BL12576, **BLACK BEAR**	14	37.3	22.5	47.0	100.0	1.5	51.0	5.0
B15443	B11363/B09175	7	37.2	25.9	47.0	99.0	1.5	52.0	5.5
B17342	B10244/B12724	40	37.2	25.3	49.0	101.0	2.5	48.0	4.0
B16507	B12720/Zenith	54	36.5	27.9	48.0	102.0	1.0	53.5	6.0
B04554	B00103*/X00822, **ZORRO**	17	36.5	23.7	49.0	101.0	1.0	51.0	5.0
B17218	B10244/B12724	21	36.2	26.0	48.0	102.0	2.0	49.5	4.0
B17323	B10244/B12724	29	35.6	24.2	48.0	99.0	2.0	49.0	4.0
B17325	B10244/B12724	45	35.4	23.0	48.0	101.0	2.0	48.0	4.0
I18625	**BLACK TAILS**	52	35.3	23.2	47.0	98.0	1.0	50.5	4.0
B17346	B10244/B12724	36	35.0	23.7	48.0	100.0	2.0	50.0	4.5
B16506	B11363//Alpena*/B09197	53	34.9	23.8	47.0	99.0	1.0	52.0	5.5
B17228	B10244/B12724	30	34.5	23.5	48.0	100.0	1.5	52.5	5.0
I17517	**ACUG 15-B4**	51	34.2	23.5	48.0	99.0	2.0	47.5	3.5
I03390	ND9902621-2, **ECLIPSE**	18	33.1	20.8	48.0	98.0	1.0	50.0	4.5
MEAN(54)			38.6	24.4	47.5	99.8	1.4	51.0	4.8
LSD(.05)			2.8	1.0	0.7	0.9	0.3	1.2	0.3
CV%			6.1	3.5	0.9	0.6	13.5	1.4	4.0

EXPERIMENT 8103 STANDARD BLACK YIELD TRIAL (2)								PLANTED: 6/1/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
B18504	Zenith//Alpena*/B09197	83	45.9	23.8	48.0	104.0	2.0	49.5	5.5
B17402	B14311/B10244	17	44.4	21.7	49.0	103.0	2.0	48.0	4.5
B16504	Zenith//Alpena*/B09197	82	44.1	23.7	48.0	104.0	1.5	51.0	5.5
B17887	B14302/B10244	59	44.0	25.1	49.0	104.0	2.0	53.0	5.5
B17023	B14303/B10244	76	44.0	22.6	49.0	102.0	1.0	53.0	5.5
B17487	B14311/B10244	7	44.0	25.3	48.0	102.0	1.0	52.0	5.5
B17871	B14302/B10244	56	43.8	22.1	48.0	102.0	2.0	51.0	5.5
B17511	B14311/B10244	2	43.8	25.4	48.0	101.0	1.0	49.0	4.5
B17528	B14311/B10244	12	43.8	23.8	48.0	104.0	2.5	52.5	5.0
B17922	B14302/B10244	42	43.7	23.8	48.0	102.0	1.0	51.5	5.5
B17449	B14311/B10244	14	43.6	23.7	49.0	102.0	1.5	51.0	5.5
B17540	B14311/B10244	18	43.4	22.6	48.0	100.0	1.0	50.0	5.0
B17460	B14311/B10244	11	43.3	24.0	49.0	103.0	1.0	52.0	5.5
B17850	B14302/B10244	47	43.1	23.7	47.0	102.0	1.5	49.0	4.5
B17486	B14311/B10244	22	43.0	22.0	48.0	102.0	1.5	51.5	4.5
B17536	B14311/B10244	6	42.9	22.8	47.0	104.0	2.0	51.5	5.0
B17832	B14302/B10244	64	42.8	20.9	49.0	102.0	1.0	51.5	5.5
B17844	B14302/B10244	52	42.8	22.3	48.0	101.0	1.0	51.0	5.0
B17541	B14311/B10244	19	42.6	22.6	48.0	102.0	1.0	50.0	5.0
B17472	B14311/B10244	10	42.5	22.6	49.0	104.0	1.0	52.5	5.0
B17522	B14311/B10244	15	42.4	23.7	48.0	104.0	2.0	51.5	5.0
B17804	B14302/B10244	46	42.3	21.9	49.0	102.0	1.0	49.5	4.5
B17879	B14302/B10244	43	42.2	22.5	48.0	100.0	1.5	48.5	4.0
B17860	B14302/B10244	62	42.1	23.6	47.0	103.0	1.5	50.0	4.5
B17859	B14302/B10244	53	42.1	22.7	47.0	100.0	1.5	48.5	4.0
B17897	B14302/B10244	67	42.0	23.2	47.0	103.0	1.0	51.5	5.5
B10244	B04644/ZORRO, **ZENITH**	78	41.8	26.0	48.0	103.0	1.5	51.5	5.0
B17703	B14311/B12724	40	41.5	23.9	48.0	100.0	1.0	49.5	4.5
B17416	B14311/B10244	1	41.4	26.9	47.0	101.0	2.5	48.0	3.5
B17659	B14311/B12724	36	41.3	23.4	47.0	101.0	1.0	52.0	4.5

EXPERIMENT 8103 STANDARD BLACK YIELD TRIAL (2)								PLANTED: 6/1/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
B17822	B14302/B10244	50	41.2	22.7	48.0	104.0	2.0	50.0	4.0
B17862	B14302/B10244	72	41.1	23.6	47.0	100.0	2.0	48.5	4.0
B17076	B14303/B10244	74	41.1	22.0	49.0	103.0	2.0	50.5	4.0
B17803	B14302/B10244	55	41.0	23.2	49.0	104.0	1.5	50.5	4.5
B17681	B14311/B12724	37	40.9	22.9	49.0	99.0	2.5	47.5	3.5
B17426	B14311/B10244	5	40.7	23.5	47.0	102.0	1.5	51.0	5.5
B17429	B14311/B10244	9	40.6	27.2	48.0	103.0	1.5	53.0	5.5
B17410	B14311/B10244	8	40.6	26.4	49.0	103.0	2.0	50.0	4.5
B17691	B14311/B12724	24	40.5	23.0	48.0	100.0	2.5	46.0	3.5
B17431	B14311/B10244	3	40.4	23.2	48.0	104.0	2.0	51.0	5.5
I18625	**BLACK TAILS**	84	40.3	22.5	47.0	99.0	2.0	49.5	4.0
B17413	B14311/B10244	20	40.2	23.0	49.0	102.0	1.0	52.0	5.5
B17813	B14302/B10244	49	40.2	22.2	47.0	102.0	1.0	50.5	5.0
B17839	B14302/B10244	68	40.1	24.4	48.0	100.0	1.5	51.0	4.5
B04554	B00103*/X00822, **ZORRO**	79	39.9	23.5	49.0	103.0	2.0	50.5	5.0
B17894	B14302/B10244	63	39.7	24.5	47.0	101.0	1.5	51.5	5.5
B17918	B14302/B10244	60	39.7	23.4	48.0	100.0	1.0	49.5	4.5
B17685	B14311/B12724	32	39.6	21.7	49.0	102.0	1.0	50.0	5.0
B17510	B14311/B10244	13	39.5	23.0	48.0	103.0	1.0	51.0	5.5
B17820	B14302/B10244	51	39.4	23.1	48.0	102.0	1.0	51.5	5.0
B17602	B14311/B12724	38	39.4	24.1	47.0	104.0	2.0	50.0	4.0
B17823	B14302/B10244	58	39.4	23.7	47.0	100.0	1.5	48.0	4.0
B17906	B14302/B10244	70	39.4	23.3	48.0	101.0	2.0	51.0	5.0
B17706	B14311/B12724	31	39.4	23.0	49.0	101.0	1.5	49.5	5.0
B17417	B14311/B10244	16	39.0	23.0	47.0	102.0	1.0	48.5	4.0
B17880	B14302/B10244	45	39.0	25.2	48.0	101.0	1.5	51.0	5.0
B17829	B14302/B10244	44	39.0	23.3	48.0	97.0	1.5	48.0	4.0
B17479	B14311/B10244	23	38.9	24.7	48.0	102.0	2.0	51.0	5.0
B17692	B14311/B12724	35	38.9	22.8	49.0	100.0	1.0	50.5	5.0
B17861	B14302/B10244	61	38.8	23.5	48.0	104.0	2.0	49.5	4.5

EXPERIMENT 8103 STANDARD BLACK YIELD TRIAL (2)								PLANTED: 6/1/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
B17907	B14302/B10244	71	38.8	24.0	49.0	101.0	1.0	49.5	4.5
B17478	B14311/B10244	4	38.7	24.5	48.0	103.0	2.0	50.5	5.0
B17624	B14311/B12724	39	38.6	23.3	48.0	99.0	1.5	49.0	4.0
B17658	B14311/B12724	27	38.5	21.8	48.0	100.0	2.0	49.5	4.5
B17838	B14302/B10244	69	38.4	23.1	48.0	102.0	2.0	47.0	4.0
B17625	B14311/B12724	26	38.3	24.3	48.0	102.0	2.5	49.0	4.0
B17749	B14311/B12724	33	38.2	22.9	47.0	101.0	2.5	50.5	4.5
B17096	B14303/B10244	75	38.1	22.1	47.0	100.0	1.0	49.0	4.5
B17477	B14311/B10244	21	37.8	21.6	47.0	102.0	1.5	49.0	4.0
B17875	B14302/B10244	41	37.8	21.5	48.0	100.0	1.5	49.0	4.5
I17501	BL12576, **BLACK BEAR**	81	37.3	22.0	48.0	102.0	2.0	51.0	5.0
B17697	B14311/B12724	30	37.2	22.8	47.0	99.0	1.5	49.0	4.0
B17892	B14302/B10244	66	37.2	21.8	48.0	102.0	1.0	50.5	4.5
B17898	B14302/B10244	57	37.0	23.0	47.0	102.0	2.0	48.5	4.0
B17699	B14311/B12724	25	36.3	23.0	48.0	101.0	1.0	50.5	5.0
B17959	B14302/B12724	77	35.8	24.0	48.0	98.0	2.5	48.0	3.5
B17671	B14311/B12724	29	35.8	23.2	47.0	100.0	1.0	49.0	4.0
B17739	B14311/B12724	34	35.4	23.2	47.0	100.0	1.0	49.0	4.0
B17730	B14311/B12724	28	35.4	23.0	47.0	100.0	1.5	51.5	5.0
B17866	B14302/B10244	65	35.4	23.7	48.0	100.0	1.0	50.0	5.0
B17841	B14302/B10244	54	34.8	23.8	47.0	101.0	1.5	51.5	4.5
B17003	B14303/B10244	73	34.7	22.2	48.0	99.0	1.0	48.5	4.0
B17920	B14302/B10244	48	33.6	22.6	47.0	99.0	2.5	50.5	4.0
I03390	ND9902621-2, **ECLIPSE**	80	31.7	21.2	47.0	98.0	1.5	47.5	4.0
MEAN(84)			40.1	23.3	47.7	101.3	1.5	50.1	4.7
LSD(.05)			3.4	1.1	0.6	1.9	0.4	2.1	0.7
CV%			6.3	3.4	0.8	1.2	16.8	2.5	9.5

EXPERIMENT 8104 PRELIMINARY BLACK YIELD TRIAL								PLANTED: 6/1/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
B18233	B15430/B13204	33	45.5	28.1	47.0	102.0	1.5	52.5	5.0
B18201	B10244/B13218	1	45.0	25.3	47.0	103.0	2.0	48.5	5.0
B18236	B14303/B12724	36	44.9	23.0	47.0	97.0	2.5	47.5	4.0
B18204	B10244/B15430	4	44.8	26.7	47.0	102.0	1.0	51.5	5.5
B18218	B14303/B13204	18	44.8	22.4	49.0	98.0	1.5	49.0	4.5
B18237	B14303/B12724	37	44.7	23.4	47.0	104.0	2.0	47.5	4.0
B18231	B15430/B10244	31	44.3	27.4	48.0	100.0	1.0	51.5	6.0
B18212	B13218/B14302	12	44.0	26.9	47.0	100.0	1.5	50.5	5.0
B18210	B13218/B14302	10	44.0	27.4	48.0	102.0	1.0	52.5	6.0
B18208	B13218/B14302	8	43.6	24.1	48.0	99.0	2.5	48.0	3.5
B18202	B10244/B13218	2	43.4	26.6	47.0	104.0	2.0	48.5	4.5
B10244	B04644/ZORRO, **ZENITH**	47	43.0	26.0	47.0	104.0	2.0	51.5	5.0
B18232	B15430/B10244	32	41.9	28.1	47.0	101.0	1.5	52.0	5.5
B18220	B14303/B13218	20	41.3	21.1	48.0	98.0	1.5	48.5	5.0
B18221	B14303/B13218	21	41.1	21.6	48.0	99.0	1.0	48.5	5.0
B18209	B13218/B14302	9	41.0	24.7	48.0	96.0	2.5	48.0	4.0
B18230	B15428/B15418	30	41.0	27.3	48.0	99.0	2.0	51.0	5.0
B18224	B15418/B10244	24	40.9	27.4	47.0	103.0	2.0	52.0	5.0
B04554	B00103*/X00822, **ZORRO**	46	40.7	23.7	48.0	104.0	2.0	48.5	5.0
B18213	B13220/B13204	13	40.3	26.3	46.0	97.0	2.0	48.0	4.0
B18223	B14303/B13218	23	40.2	20.8	49.0	99.0	1.0	49.5	5.0
I17501	BL12576, **BLACK BEAR**	48	40.2	22.0	46.0	101.0	2.0	49.5	4.5
B18238	B14303/B12724	38	40.1	21.8	47.0	97.0	1.5	49.5	4.5
B18229	B15418/B13204	29	40.0	26.8	47.0	100.0	1.5	50.5	4.5
B18228	B15418/B13204	28	39.9	28.7	47.0	100.0	2.0	51.5	4.5
B18219	B14303/B13204	19	39.7	25.0	48.0	100.0	1.0	50.5	5.0
B18234	B15430/B13204	34	39.5	27.2	47.0	105.0	2.5	49.0	4.0
B18241	B14303/B12724	41	39.2	20.9	47.0	98.0	1.5	47.5	4.0
B18215	B13220/B14302	15	38.9	25.5	47.0	96.0	1.5	47.0	4.0
B18226	B15418/B10244	26	38.9	27.7	47.0	98.0	2.0	48.5	4.5

EXPERIMENT 8104 PRELIMINARY BLACK YIELD TRIAL								PLANTED: 6/1/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
B18225	B15418/B10244	25	38.7	26.5	47.0	100.0	2.0	49.0	4.0
B18216	B13220/B14302	16	38.5	23.0	47.0	97.0	1.5	48.5	4.5
B18211	B13218/B14302	11	38.5	25.5	47.0	99.0	1.5	49.0	4.5
B18245	B15418/B13220	45	38.4	26.8	46.0	98.0	2.5	48.5	4.0
B18205	B13218/B13220	5	38.3	25.1	47.0	98.0	2.0	48.0	4.0
B18214	B13220/B13204	14	38.3	26.3	46.0	99.0	2.0	50.5	5.0
B18240	B14303/B12724	40	38.3	21.0	48.0	97.0	1.0	47.5	4.0
B18227	B15418/B13204	27	38.1	25.8	47.0	101.0	1.5	53.0	5.0
B18217	B14303/B13204	17	38.1	23.4	48.0	100.0	1.0	50.5	5.0
B18207	B13218/B14302	7	38.0	23.4	47.0	98.0	1.5	48.5	4.5
B18206	B13218/B13220	6	37.8	25.1	47.0	98.0	1.5	49.0	4.0
B18235	B14303/B12724	35	37.5	21.6	47.0	95.0	3.0	47.0	3.0
B18222	B14303/B13218	22	37.3	21.0	48.0	98.0	1.5	47.5	4.5
B18242	B15418/B13220	42	37.0	27.6	46.0	97.0	2.5	48.0	3.5
B18239	B14303/B12724	39	36.4	21.9	49.0	98.0	2.0	50.0	4.0
B18244	B15418/B13220	44	35.0	23.9	46.0	95.0	3.0	46.0	3.0
B18203	B10244/B13220	3	34.0	23.6	47.0	96.0	2.0	49.0	3.5
B18243	B15418/B13220	43	33.6	24.1	47.0	97.0	2.5	51.0	4.0
MEAN(48)			40.2	24.8	47.0	99.0	1.8	49.4	4.5
LSD(.05)			3.5	1.0	0.7	0.6	0.6	1.5	0.6
CV%			6.3	3.0	0.8	0.3	18.6	1.9	7.5

EXPERIMENT 8105 STANDARD GREAT NORTHERN YIELD TRIAL								PLANTED: 6/4/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
G17410	G13467/G13479	1	36.4	39.2	44.0	103.0	1.5	51.0	5.0
G18503	G13444/G14506	26	36.1	32.5	45.0	99.0	2.0	50.0	5.0
G18505	G14506/G13444	28	36.1	34.0	45.0	99.0	2.5	48.5	4.5
G16351	Eldorado/G13467	2	35.8	37.4	45.0	101.0	1.5	52.0	6.0
G16345	G12508/G13455	6	35.4	32.6	44.0	97.0	1.5	49.0	4.5
G18502	G13444/G14506	25	35.3	34.2	45.0	101.0	2.5	49.0	4.5
G18512	G14525/P14815	35	33.8	37.1	45.0	100.0	1.5	48.5	4.5
G16305	Powderhorn/G12501	20	33.8	39.3	44.0	100.0	1.0	51.5	5.0
G18506	G14525/G13444	29	33.8	41.9	44.0	100.0	2.5	47.5	4.0
G16317	G11438/G11464	17	33.3	39.0	44.0	99.0	3.0	47.0	3.5
G14503	G11404/G11469	12	33.3	38.4	44.0	100.0	2.5	46.5	3.5
G18509	G14525/G13444	32	33.2	40.5	44.0	98.0	3.0	45.5	3.5
G16346	G13455/G13478	7	33.1	42.0	46.0	100.0	2.0	51.0	5.5
G16301	Powderhorn/GN9-4	11	32.9	43.5	44.0	100.0	2.5	48.5	4.0
G18510	G14525/G13444	33	32.9	42.9	44.0	100.0	2.5	46.5	3.5
G16338	G12508/G11429	19	32.8	33.9	48.0	102.0	2.5	48.0	4.0
G18517	P14815/G14525	40	32.8	35.6	45.0	98.0	3.0	46.5	3.0
G18504	G14506/G13444	27	32.5	30.6	44.0	99.0	2.0	49.0	4.5
G17418	G14530/G11431	13	32.4	34.3	49.0	100.0	2.0	53.0	6.0
I17509	**TAURUS**	23	31.7	41.8	45.0	102.0	2.5	49.5	4.0
G16314	G11429/G11438	8	31.5	34.6	45.0	98.0	2.5	49.5	5.5
G16347	G13467/G11429	4	31.5	34.4	45.0	98.0	2.5	47.5	4.0
G16328	G12508/G11464	9	31.2	37.4	45.0	99.0	2.0	48.0	4.5
G17417	G14530/G11431	18	31.1	36.7	46.0	102.0	2.0	51.0	5.0
G18513	G14525/P14815	36	30.6	41.1	44.0	100.0	2.0	47.5	4.5
G18507	G14525/G13444	30	30.5	38.6	44.0	100.0	2.5	47.0	4.0
G18514	G14525/P14815	37	30.2	39.0	45.0	98.0	1.5	49.5	5.0
I18601	**ARIES**	22	30.2	39.7	44.0	97.0	3.0	47.5	3.0
I17544	GN16-7	42	29.7	40.6	44.0	103.0	2.0	50.0	4.5
G16306	Powderhorn/G12501	15	29.7	37.7	44.0	100.0	1.5	51.5	6.0

EXPERIMENT 8105 STANDARD GREAT NORTHERN YIELD TRIAL									PLANTED: 6/4/18
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**
G16318	G11438/G12502	10	29.6	47.6	44.0	100.0	2.0	47.5	4.0
G17419	G14505/P07863	16	29.2	34.3	46.0	100.0	2.0	48.0	4.0
G16319	G11464/G11404	5	29.2	41.2	44.0	96.0	2.0	45.5	3.0
G18508	G14525/G13444	31	29.2	43.1	44.0	100.0	2.0	48.0	4.5
G16339	G12508/G13478	3	28.5	29.1	46.0	99.0	2.5	47.5	3.5
G18511	G14525/G13444	34	27.9	43.6	44.0	98.0	2.0	47.0	4.0
G17408	G13444/G14508	14	27.8	32.5	45.0	98.0	3.0	46.5	3.5
G08254	G04514/Matterhorn, **POWDERHORN**	21	27.7	40.1	44.0	97.0	2.0	49.5	4.0
G18515	G14525/I13445	38	27.7	39.8	44.0	99.0	3.0	47.5	3.5
G18518	P14815/P14811	41	26.3	33.8	45.0	97.0	2.0	47.5	4.5
G18501	G13444/G14506	24	26.0	40.8	45.0	99.0	2.5	47.0	3.5
G18516	P14815/G14525	39	25.6	42.3	47.0	101.0	2.0	46.5	4.0
MEAN(42)			31.4	38.1	44.6	99.2	2.2	48.5	4.3
LSD(.05)			3.9	1.5	1.0	2.3	0.9	2.1	1.1
CV%			10.6	3.5	1.3	1.4	23.4	2.6	15.5

EXPERIMENT 8106 STANDARD TEBO YIELD TRIAL								PLANTED: 6/4/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
G18904	G12901/B14302	18	45.2	22.2	43.0	101.0	1.8	50.5	4.8
G17807	G12901/G13424	13	42.2	28.4	43.0	101.0	2.3	49.3	4.8
G18905	G12901/B14302	19	42.1	21.2	43.0	98.0	1.8	48.3	4.3
G18902	G12901/B14302	16	41.8	23.6	44.0	98.0	1.3	50.8	5.8
G17803	G12901/G11431	12	41.3	30.0	43.0	101.0	2.0	49.3	4.8
G17804	G12901/G11431	9	40.6	31.0	43.0	103.0	2.3	48.3	4.3
G18908	G12901/B14303	22	40.3	22.4	43.0	97.0	1.8	47.8	4.3
G18901	G12901/B14302	15	39.4	23.9	43.0	98.0	1.5	50.8	5.8
G17802	G12901/G11431	11	39.3	30.8	43.0	101.0	2.0	49.0	4.5
G18903	G12901/B14302	17	39.3	21.6	43.0	102.0	1.8	49.5	4.3
G12901	G07321/Fuji, **SAMURAI**	7	39.2	31.1	43.0	103.0	2.0	48.5	4.3
G18910	G12901/B14303	24	39.2	24.9	43.0	99.0	1.8	48.5	4.5
G17806	G12901/G13424	4	38.5	29.8	44.0	102.0	2.0	48.8	4.8
G17925	G14505/G12901	2	38.4	33.4	45.0	97.0	2.3	48.0	3.8
G18906	G12901/B14303	20	37.7	24.4	44.0	100.0	1.5	49.8	5.3
G18909	G12901/B14303	23	37.3	22.0	43.0	100.0	2.3	48.0	4.3
G17805	G12901/G13424	6	37.0	29.7	43.0	102.0	2.0	48.3	4.8
G17932	G12901/G15479	10	36.1	30.7	43.0	77.0	2.3	48.3	4.0
G17901	G14505/G12901	14	35.6	32.5	44.0	101.0	2.0	47.8	4.0
G18907	G12901/B14303	21	34.6	22.6	43.0	99.0	1.3	50.5	5.5
G17913	G14505/G12901	1	33.6	29.2	43.0	97.0	2.5	45.5	3.3
G17926	G14505/G12901	8	33.4	29.0	43.0	100.0	2.3	47.5	4.0
G17923	G14505/G12901	3	32.9	27.2	44.0	101.0	2.3	49.8	4.8
G17916	G14505/G12901	5	32.7	27.6	44.0	96.0	2.3	47.8	3.3
MEAN(24)			38.2	27.0	43.2	98.8	1.9	48.8	4.5
LSD(.05)			4.4	1.1	0.8	10.8	0.5	1.2	0.7
CV%			9.8	3.4	1.0	9.3	23.8	2.1	13.7

EXPERIMENT 8107 STANDARD PINTO YIELD TRIAL								PLANTED: 6/4/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
P16901	Eldorado/P11519	1	39.7	43.5	46.0	100.0	2.0	50.5	4.5
P17509	SDP H/H BULK	6	38.3	44.9	46.0	102.0	2.5	49.5	4.0
P17510	SDP H/H BULK	3	37.8	44.5	45.0	101.0	2.0	52.5	5.0
P17507	SDP H/H BULK	11	37.8	46.9	44.0	102.0	2.0	51.5	4.5
P18608	P11522/LONG'S PEAK	35	37.7	37.6	47.0	98.0	2.0	50.5	4.5
P18602	P14815/G14525	29	37.2	47.6	44.0	98.0	2.0	49.0	4.5
P18601	P14815/G14525	28	37.1	46.7	45.0	101.0	2.0	48.5	4.5
P17508	SDP H/H BULK	13	36.3	44.2	45.0	102.0	2.0	52.0	4.5
P18607	SDP H/H BULK	34	35.8	44.5	45.0	102.0	2.5	50.5	4.5
P14814	P11522/LONG'S PEAK	18	35.6	40.8	45.0	100.0	2.0	51.5	5.0
I17541	PT16-15	36	35.0	35.6	44.0	103.0	2.5	50.0	4.0
P07863	AN-37/P02630, **ELDORADO**	5	34.8	44.8	44.0	103.0	2.0	50.0	4.5
P16904	P11519/P12610	12	34.5	37.3	44.0	97.0	1.0	50.5	4.5
I17521	CO 43732-15	22	34.3	46.8	44.0	96.0	2.0	48.5	4.0
P16905	P11519/P12610	4	33.9	36.7	45.0	97.0	1.5	50.5	5.0
I14520	Santa Fe/PS08-108, SF103-8, **PALOMINO**	20	33.6	41.7	43.0	100.0	2.0	46.5	3.5
P18603	P14815/G14525	30	33.2	45.5	49.0	101.0	2.0	49.0	5.0
P16902	P11519/P12610	7	33.2	38.7	44.0	97.0	1.5	51.5	5.0
P17502	P07863/X14110	17	31.8	40.3	43.0	96.0	1.0	51.0	5.0
P16906	P11519/P12610	16	31.8	34.1	43.0	96.0	1.0	49.5	4.5
I14531	CO 14790-3, **DR WOOD**	26	30.8	41.3	45.0	102.0	2.0	48.0	4.0
P18606	G14525/P14815	33	30.6	41.5	44.0	98.0	1.0	51.5	5.0
I07113	PNE-6-94-75/Kodiak, **LAPAZ**	2	30.4	39.6	44.0	96.0	2.0	49.0	3.0
P18604	P14815/G14525	31	30.3	46.1	46.0	98.0	2.0	50.0	5.0
P16914	P11519/G13467	10	30.2	39.5	43.0	99.0	2.0	50.0	4.5
I17525	CO 33503-5	24	30.1	44.1	44.0	96.0	2.0	47.5	3.5
P16909	P12604/P12610	8	30.0	38.2	44.0	98.0	1.5	51.5	5.0
P18605	P14815/P14811	32	29.8	39.8	44.0	96.0	2.0	50.0	4.0
I15644	COSD-35, **STAYBRIGHT**	25	29.7	38.0	46.0	98.0	3.0	49.0	4.0
P17401	P14801/I14531	19	29.6	33.8	44.0	97.0	1.0	50.5	5.0
I17516	**TWIN FALLS**	27	28.4	36.7	46.0	98.0	1.0	52.0	5.0
P14812	P09425/P08161	9	26.3	45.0	43.0	95.0	2.0	48.0	3.0
P16911	P12610/P11519	21	25.9	38.1	43.0	99.0	1.5	52.0	5.0
P16907	P12604/P12610	14	25.8	37.6	43.0	97.0	1.0	51.5	5.0
I17524	CO 34435-15	23	25.8	39.6	48.0	95.0	2.5	46.5	3.0
P16918	CO 91212-3/P12613	15	25.0	39.5	43.0	95.0	2.0	47.0	3.0
MEAN(36)			32.4	41.1	44.4	98.5	1.8	49.9	4.4
LSD(.05)			4.5	1.6	1.6	1.6	0.3	1.5	0.8
CV%			11.9	3.4	2.1	0.9	9.7	1.8	10.5

EXPERIMENT 8108 STANDARD RED AND PINK YIELD TRIAL								PLANTED: 6/4/18	
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**
S18903	S14706/R13752	27	48.8	44.9	44.0	102.0	3.0	47.5	3.0
R18409	R12859/R13506	24	47.4	45.2	44.0	104.0	2.5	51.0	4.5
S18901	S14706/S08418	25	45.4	45.9	44.0	102.0	3.0	45.5	3.0
R18407	R12859/R13506	22	45.4	44.3	43.0	105.0	2.5	50.0	4.0
S18906	S14706/R13752	30	44.5	43.6	45.0	100.0	3.0	46.0	3.5
S18908	S14706/R13752	32	44.3	42.1	45.0	99.0	3.0	45.5	3.0
R18406	R12859/R13506	21	44.2	45.5	43.0	105.0	2.5	50.0	4.0
S18905	S14706/R13752	29	43.8	45.3	45.0	100.0	2.5	48.0	4.5
R18408	R12859/R13506	23	43.5	45.3	43.0	105.0	2.0	51.0	4.5
S08418	S02754/S04503, **ROSETTA**	10	43.4	41.7	43.0	99.0	2.0	49.5	4.0
R18405	R12859/R13506	20	43.3	45.1	43.0	104.0	2.0	51.0	4.5
S18904	S14706/R13752	28	43.0	46.3	43.0	100.0	2.0	51.5	5.5
S18907	S14706/R13752	31	42.9	43.6	44.0	100.0	2.0	50.5	5.0
S16804	S08418/S12904	7	42.0	43.2	44.0	98.0	2.0	50.0	4.0
S16809	S12906/R11614	13	41.6	41.0	43.0	101.0	2.0	49.0	4.0
S18909	S14706/R13752	33	41.3	43.2	44.0	102.0	2.0	53.0	6.0
S18902	S14706/S08418	26	41.2	45.0	43.0	99.0	2.5	46.0	3.5
I13401	SR 09303, VIPER	2	41.2	34.3	43.0	101.0	1.0	51.0	4.5
R17605	R12859/R12844	6	40.3	42.6	43.0	102.0	2.0	52.5	5.5
S17705	S14708/X14117	11	40.0	43.4	46.0	102.0	2.0	53.0	6.0
R18401	R12859/R12844	16	40.0	41.0	44.0	103.0	3.0	49.0	4.0
S17706	S14708/X14117	5	39.3	39.1	46.0	100.0	1.5	52.5	5.0
R12844	SR9-5/R09508, **CAYENNE**	3	38.8	39.2	43.0	99.0	2.5	48.5	4.5
R18402	R12859/R12844	17	38.8	41.2	44.0	103.0	2.0	51.5	4.5
S17702	R12843/S14705	15	38.7	39.0	44.0	99.0	3.0	44.5	3.0
R18403	R12859/R12844	18	38.6	40.9	44.0	101.0	2.0	50.5	5.0
R17602	R12845/R12859	9	38.4	42.5	44.0	101.0	2.0	52.0	6.0
R17604	R12859/R12844	4	38.3	38.9	43.0	101.0	2.0	52.0	5.0
R17603	R12859/R12844	1	37.8	38.9	44.0	100.0	2.0	50.0	5.0
R18404	R12859/R12844	19	37.4	40.5	43.0	101.0	2.0	50.5	5.0
S18910	Rosetta/I14519	34	37.2	43.0	44.0	99.0	2.0	50.5	5.0
R17601	R12844/S14707	12	37.1	41.5	43.0	100.0	2.5	50.5	4.5
S18912	Rosetta/I14519	36	37.0	42.7	44.0	99.0	2.0	50.0	4.5
S18911	Rosetta/I14519	35	36.6	45.0	44.0	99.0	2.0	48.5	4.5
R16522	R98026/I11207	8	36.4	43.0	43.0	101.0	3.0	47.5	3.5
R98026	R94037/R94161, **MERLOT**	14	34.1	42.6	43.0	101.0	3.0	46.5	4.0
MEAN(36)			40.9	42.5	43.5	100.7	2.3	49.6	4.4
LSD(.05)			3.3	1.8	0.5	1.8	0.6	2.1	0.8
CV%			6.9	3.6	0.7	1.0	14.6	2.5	11.2

EXPERIMENT 8109 MRPN/CDBN YIELD TRIAL								PLANTED: 6/4/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
I18609	PK 16-7	9	42.9	41.2	43.0	100.0	2.0	50.5	4.5
I18611	PT 16-17	11	40.9	37.7	50.0	110.0	3.5	45.5	3.0
R17604	R12859/R12844	19	40.4	36.4	43.0	101.0	2.0	49.5	5.0
R12844	SR9-5/R09508, **CAYENNE**	36	39.6	38.1	43.0	99.0	2.0	50.5	5.0
I16707	ND121315	2	39.4	43.4	43.0	97.0	3.0	46.0	4.0
G17410	G13467/G13479	16	39.1	38.9	43.0	102.0	1.0	52.5	5.5
I07113	PNE-6-94-75/Kodiak, **LAPAZ**	20	38.8	38.0	43.0	95.0	3.0	49.5	4.0
I18619	NE2-17-18	27	38.7	48.7	43.0	96.0	4.0	45.0	3.0
R98026	R94037/R94161, **MERLOT**	21	38.5	42.6	43.0	98.0	2.5	48.5	4.0
P16905	P11519/P12610	17	38.2	37.5	47.0	100.0	2.0	49.5	5.0
I11223	PK7-4	33	38.1	40.7	43.0	100.0	3.0	47.0	4.0
I18622	AAC **ARGOSY**	35	36.8	25.4	42.0	104.0	2.0	50.0	4.0
R17603	R12859/R12844	18	36.3	36.9	43.0	99.0	2.0	51.0	5.0
I18608	NE2-17-37	8	35.8	40.9	43.0	104.0	3.0	46.5	4.0
I18601	**ARIES**	22	34.5	39.2	42.0	99.0	3.0	46.5	4.0
I18618	PT11-13B	26	34.1	41.2	43.0	96.0	2.5	47.5	4.0
I17519	ND131413	1	33.3	40.6	42.0	100.0	3.0	53.5	4.0
I18613	CO 34399-14	13	32.8	40.8	45.0	96.0	3.5	47.0	3.5
I18606	NE1-17-36	6	32.7	42.5	42.0	96.0	3.0	46.5	4.0
I18607	NE2-17-20	7	32.7	42.9	43.0	97.0	3.5	45.0	3.0
I18612	CO 32330-14	12	32.6	41.3	46.0	97.0	2.5	48.0	3.5
I18603	NDF140722	3	31.7	39.1	42.0	97.0	3.0	47.0	4.0
I17518	ACUG 14-1, AAC **SHOCK**	34	31.5	26.3	43.0	103.0	2.0	49.0	4.0
I18614	CO 52646-14	14	31.4	44.2	43.0	95.0	3.0	46.5	3.5
I18605	NE1-17-19	5	31.4	42.5	42.0	94.0	3.5	45.5	3.0
I14520	Santa Fe/PS08-108, SF103-8, **PALOMINO**	29	31.1	38.3	43.0	100.0	3.0	46.0	4.0
I16711	ACUG 13-SR1, OAC **ROSITO**	31	30.8	25.8	44.0	96.0	1.5	49.5	5.0
I18620	NE2-17-39	28	29.4	42.2	43.0	99.0	4.5	43.5	3.0
I18610	GN 16-16	10	29.4	40.5	43.0	99.0	2.5	46.5	4.0
I18615	CO 15015	15	29.1	49.2	43.0	95.0	3.0	47.0	3.0
I15605	SR10-2-1	32	28.7	44.9	42.0	96.0	2.5	46.5	4.0
I18604	ND121885	4	28.4	45.9	43.0	95.0	3.0	47.5	4.0
I18617	PT16-18	25	28.3	35.8	45.0	110.0	3.5	45.0	3.0
I84002	NW410//VICTOR/AURORA, **OTHELLO**	24	28.0	40.2	38.0	93.0	3.5	43.5	3.0
I18621	NE1-17-10	30	26.5	37.8	43.0	97.0	3.0	47.5	4.0
I18616	ACUG 16-NDP1	23	25.7	36.7	44.0	102.0	2.5	48.5	5.0
MEAN(36)			33.8	39.6	43.0	98.6	2.8	47.6	4.0
LSD(.05)			4.1	2.1	1.7	3.2	0.7	2.2	0.4
CV%			8.9	3.9	2.3	1.9	15.8	2.7	6.6

EXPERIMENT 8110 ALICE MACQUEEN-CDBN CLASSICS YIELD TRIAL									PLANTED: 6/4/18
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**
I91205	55012	1	19.8	43.3	38.0	90.0	3.5	45.0	3.0
I01768	93_207G	2	30.2	39.7	46.0	101.0	3.0	45.5	3.5
I00615	97_409P	3	27.1	46.2	42.0	95.0	3.0	44.0	3.0
I09101	CBB/Matterhorn//Maverick, **ND-307**	4	28.4	45.6	43.0	101.0	2.0	49.5	4.0
P89430	81-12034/P86297, **AZTEC**	5	19.8	42.0	43.0	92.0	3.0	45.5	3.0
I09106	**MAX**	6	16.3	46.0	37.0	90.0	4.0	44.0	3.0
I99117	**BUSTER**	7	28.3	40.9	43.0	97.0	3.0	46.0	4.0
I89003	**UI537**	8	25.3	44.1	36.0	92.0	4.0	43.0	3.0
I86081	WM1-85-43 UN GN, **STARLIGHT**	9	22.6	45.5	42.0	100.0	3.0	44.0	3.5
I02001	**YOLANO**	10	22.7	33.5	39.0	93.0	3.5	44.5	3.0
MEAN(10)			24.0	42.7	40.7	94.9	3.2	45.1	3.3
LSD(.05)			2.0	1.8	1.2	3.2	0.6	1.9	0.5
CV%			6.0	3.0	1.6	1.9	10.4	2.2	9.0

EXPERIMENT 8113 DRY BEAN DROUGHT NURSERY YIELD TRIAL									PLANTED: 6/4/18
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
B16504	Zenith//Alpena*/B09197	2	44.2	23.6	44.0	100.0	1.0	52.0	6.5
B10244	B04644/ZORRO, **ZENITH**	3	42.2	24.3	44.0	100.0	1.0	52.0	6.0
R12844	SR9-5/R09508, **CAYENNE**	4	38.0	39.0	43.0	97.0	2.0	53.0	5.0
I18623	PT16-9	7	37.9	43.1	44.0	100.0	2.0	53.0	5.0
I18627	NE13-17-11	25	37.6	31.7	43.0	109.0	3.0	48.5	3.0
I15633	PT 9-5-6	9	35.8	40.6	43.0	98.0	1.0	50.0	5.0
I15647	CO 14790-3, **DR WOOD**	12	35.6	40.8	48.0	104.0	3.0	49.0	3.5
I17544	GN16-7	8	35.1	40.2	44.0	101.0	2.0	52.5	4.5
I18611	PT 16-17	5	34.3	34.5	50.0	110.0	3.5	46.0	3.0
I18624	NE2-17-6	23	33.5	44.0	45.0	97.0	3.0	48.0	4.0
I10134	TARS-MST1	20	33.3	25.6	44.0	97.0	1.0	48.5	4.5
I11223	PK7-4	6	33.1	39.9	43.0	97.0	3.0	47.5	3.0
R98026	R94037/R94161, **MERLOT**	31	32.2	42.1	44.0	100.0	2.5	49.5	4.0
I14553	Merlotx(05F-5055-1x98020-3-1-6-2)	21	31.9	34.4	43.0	96.0	1.0	51.5	4.5
I16708	**XRAV-40-4**	28	31.9	25.8	43.0	93.0	2.0	47.0	3.5
N14229	N11275/N11256	1	31.1	19.8	47.0	99.0	1.5	52.5	6.0
I17537	SB2_89_9, 15F-13029	19	30.8	33.3	43.0	94.0	2.0	49.0	3.5
I05834	ND020351, **STAMPEDE**	32	30.7	37.9	43.0	97.0	2.5	49.0	4.5
I13450	CO 91212-4, **CENTENNIAL**	11	30.0	39.7	43.0	103.0	2.5	49.5	3.5
I16716	SB2_171, MATT/G21212///MATT/DOR364//USPT-ANT1/H405-8-1-1	18	29.6	28.5	43.0	94.0	3.0	47.0	3.0
I06251	CO23704, **CROISSANT**	10	29.4	42.1	43.0	96.0	3.0	48.0	4.0
I16714	SB2_143, ABC USPT-CBB-5/Stampede	16	29.2	37.1	43.0	91.0	3.0	46.5	3.0
I18626	NE14-17-2	24	28.3	26.3	44.0	102.0	2.0	48.0	4.0
I14546	(USPT-ANT)x('Matterhornx98078-5-1-5-1)	14	27.7	41.6	42.0	96.0	2.0	48.0	4.0
I17540	1765 (689-736)	27	27.2	24.3	44.0	97.0	1.0	51.0	5.0
I09109	CO55646, **LONG'S PEAK**	13	27.1	40.9	45.0	96.0	3.0	47.0	4.0
I17534	SB2_1_0, Matterhon/EMP509	15	26.6	33.5	44.0	96.0	2.5	50.5	3.5
BC200	NE1-09-19	22	25.2	38.5	43.0	98.0	3.0	47.0	3.0
I17535	SB2_4, Matterhon/EMP509	17	23.8	33.0	46.0	99.0	2.5	49.5	4.0
G93414	**MATTERHORN**	29	22.8	35.5	43.0	95.0	2.0	47.5	3.5
I17514	**BLACKFOOT**	26	16.8	39.7	42.0	90.0	2.0	47.5	3.0
BC138	**MARQUIS**	30	14.9	35.4	42.0	90.0	3.0	45.5	2.5
MEAN(32)			30.9	34.9	43.7	97.7	2.2	49.1	4.0
LSD(.05)			4.4	2.0	1.0	3.4	0.6	2.0	0.7
CV%			10.5	4.2	1.4	2.1	15.0	2.4	10.7

EXPERIMENT 8214 STANDARD KIDNEY YIELD TRIAL								PLANTED: 6/12/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
K17209	K11306/K08961	40	33.1	60.0	35.0	96.0	2.0	50.5	3.5
K15601	K11306/K11916	7	31.4	48.6	40.0	97.0	1.5	51.5	5.5
I15622	**DYNASTY**	14	30.5	67.3	39.0	100.0	2.0	52.0	3.5
I18602	**LRK 6**	26	30.2	51.8	39.0	95.0	1.5	48.5	4.5
K17703	K11714/X14209	42	30.0	58.1	38.0	97.0	1.5	51.5	5.5
K17701	K11714/X14208	56	29.9	59.6	34.0	96.0	1.5	53.0	5.0
K17815	K11306/K08961	38	29.3	55.6	40.0	97.0	1.5	51.5	4.5
K16950	K12219/K08961	28	29.1	57.5	43.0	100.0	2.0	52.0	4.0
K16131	K11914/K12209	1	29.0	63.5	39.0	98.0	1.0	50.0	4.5
K16657	K13603/H9659-21-1	12	28.9	56.8	35.0	97.0	1.0	49.0	3.5
K16924	K11917/K08961	6	28.6	59.8	35.0	93.0	1.0	49.5	5.0
K17704	K11714/X14209	48	28.1	57.8	33.0	96.0	2.0	52.0	5.0
K15304	K11306/K11916	20	28.1	49.0	41.0	97.0	1.0	49.0	5.5
I15620	DRK 07323, **CHAPARRAL**	4	27.7	51.1	39.0	97.0	2.5	49.0	3.5
K16943	K12209/K13907	16	27.7	48.9	40.0	97.0	2.0	51.0	4.0
K17702	K11714/X14208	50	27.5	58.9	34.0	96.0	1.5	50.0	5.0
K08961	K04604/USDK-CBB-15, **SNOWDON**	32	27.5	68.0	33.0	90.0	1.0	49.5	5.5
K16640	K11914/K12209	9	27.3	61.1	39.0	98.0	1.0	52.5	5.0
K17804	K11714/X14211	35	27.3	55.7	36.0	99.0	2.0	53.0	4.0
I11233	OAC 07-L1, **OAC INFERNO**	23	27.2	61.3	40.0	101.0	3.0	53.5	3.5
K16934	I05101/K08961	5	27.2	57.8	37.0	96.0	2.5	52.0	4.0
K16981	K13902/I93127	15	26.9	52.7	40.0	99.0	2.0	54.0	5.0
K17201	K11306/X14202	54	26.9	57.2	38.0	95.0	1.0	50.0	5.0
I11201	Pink Panther//ZAA/Montcalm, **CLOUSEAU**	10	26.8	71.5	33.0	92.0	1.0	48.5	4.0
K15901	K11714/K11914	3	26.8	59.3	34.0	90.0	1.0	48.0	4.5
K17819	K14101/K14804	45	26.5	61.9	37.0	96.0	1.5	54.0	4.5
K17207	K11306/X14202	44	26.4	46.5	39.0	91.0	2.0	49.5	4.0
K90902	BEA/50B1807//LASSEN, **BELUGA**	8	26.2	57.9	39.0	99.0	2.0	53.0	4.5
K11306	K06621/USDK-CBB-15, **RED CEDAR**	31	26.2	50.7	39.0	95.0	2.0	51.0	4.5
I13422	ACUG 10-W1, **YETI**	22	26.0	60.8	40.0	99.0	2.0	52.0	4.0

EXPERIMENT 8214 STANDARD KIDNEY YIELD TRIAL								PLANTED: 6/12/18	
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**
K16136	K12206/I07151	17	25.8	54.1	38.0	97.0	1.0	50.5	5.0
I13421	ND061106, **ROSIE**	24	25.7	52.6	38.0	99.0	2.0	54.5	4.5
I15619	LRK 09351, **BIG RED**	18	25.5	64.5	34.0	91.0	1.0	48.5	4.0
K17206	K11306/X14202	37	25.4	47.8	39.0	90.0	1.0	48.5	4.0
K16911	K08961/K12214	11	25.4	65.1	35.0	96.0	1.0	49.5	4.5
K74002	MDRK/CN(3)-HBR(NEB#1), **MONTCALM**	30	25.3	59.9	37.0	99.0	2.0	49.5	4.0
K16962	K12206/K08961	13	25.1	52.1	42.0	97.0	2.0	52.5	4.5
I90013	**CELRK**	33	25.1	65.0	34.0	89.0	1.0	45.0	4.0
K17203	K11306/X14202	52	25.1	56.7	37.0	94.0	1.5	49.0	4.5
K16957	K12206/K08961	2	25.0	58.7	37.0	97.0	2.0	52.5	4.5
K16624	CBB-15/Snowdon	27	25.0	59.3	42.0	97.0	2.0	50.5	4.0
K17825	K13902/K14804	43	24.9	63.8	35.0	93.0	1.0	49.0	5.0
K17827	K13902/K14804	39	24.8	65.0	35.0	91.0	1.5	48.5	5.0
K17824	K13902/K14804	46	24.7	54.1	34.0	89.0	1.0	48.5	5.0
K16967	K08961/I13465	25	24.5	64.4	38.0	100.0	2.0	53.0	4.0
K16130	K11320/I07151	21	24.1	48.8	40.0	98.0	2.0	52.5	4.5
K17805	K11714/X14211	34	24.1	61.1	36.0	98.0	2.5	52.0	4.0
K17202	K11306/X14202	53	24.0	56.8	38.0	96.0	1.5	50.5	5.0
K90101	CHAR/2*MONT, **RED HAWK**	29	23.9	58.7	36.0	96.0	1.0	49.0	4.0
K17204	K11306/X14202	55	23.2	54.9	38.0	98.0	1.0	52.0	4.5
K17806	K08961/K14810	49	22.3	64.4	38.0	93.0	1.0	49.0	4.0
K17208	K11306/X14202	47	21.9	49.7	38.0	93.0	1.5	49.0	4.0
I13420	ND061210, **TALON**	19	21.7	55.4	40.0	97.0	1.5	51.5	4.5
K17706	K11306/K14806	51	21.0	61.4	41.0	92.0	1.0	49.5	4.0
K17818	K14101/K14804	41	20.0	49.4	37.0	93.0	1.5	50.5	4.5
K17816	K11306/K14806	36	19.1	44.2	40.0	94.0	1.0	50.5	5.5
MEAN(56)			26.2	57.4	37.4	95.4	1.6	50.6	4.4
LSD(.05)			4.5	2.8	1.9	2.6	0.6	2.2	0.9
CV%			12.7	3.6	3.0	1.7	23.1	2.6	11.6

EXPERIMENT 8215 STANDARD YELLOW BEAN YIELD TRIAL								PLANTED: 6/12/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
Y16507	PR1146-123/Y11405	14	29.5	44.5	39.0	89.0	1.0	47.0	4.5
Y18701	K08961/UYOLE 98	22	28.5	60.6	38.0	94.0	2.0	50.5	5.0
Y18703	X15305/X15302	24	25.9	41.8	38.0	94.0	1.0	48.0	5.5
I17506	**SVS-0863**	3	25.8	42.9	40.0	92.0	3.0	47.5	3.0
Y18702	K08961/UYOLE 98	23	24.9	65.0	39.0	94.0	2.0	49.5	5.0
Y17605	Y11405*/UC Canario707	17	24.3	47.0	39.0	96.0	1.5	51.0	4.0
I17504	**AAC Y012**	7	24.2	47.5	34.0	89.0	1.0	48.0	4.0
Y17604	Y11405*/UC Canario707	11	24.1	43.8	38.0	95.0	1.0	50.0	5.5
Y17501	Y11405/PR1146-123 (oblong)	5	23.7	44.7	36.0	92.0	1.0	49.0	5.0
I14513	DBY-28-1	2	23.4	45.6	43.0	93.0	3.0	48.5	3.0
Y17606	Y11405*/UC Canario707	10	23.2	46.0	39.0	96.0	1.0	51.5	4.5
I14515	DBY-60-1, **PATRON**	1	22.8	45.2	42.0	93.0	3.0	47.0	3.0
Y11405	FR-07-AZP-14-06	13	22.0	49.3	38.0	92.0	1.0	49.0	4.5
Y17502	Y11405/PR1146-123 (round)	6	22.0	43.0	38.0	95.0	1.0	49.0	5.5
Y16503	Y11405/UC Canario 707	4	21.9	41.7	40.0	99.0	1.5	53.0	4.5
Y17603	Y11405*/UC Canario707	9	21.3	48.2	39.0	96.0	1.5	51.0	4.5
Y17614	UC Canario707/Y11405//PR1146-123/Y11405	20	20.6	45.8	39.0	95.0	1.0	50.0	5.5
I17505	**AAC Y015**	8	20.5	48.6	34.0	90.0	1.0	49.0	4.5
Y17617	Y11405/UC Canario707//Y11405	19	20.5	46.1	38.0	93.0	1.0	49.5	5.0
Y17601	Y11405*/UC Canario707	12	20.5	49.0	41.0	97.0	1.5	52.5	5.0
Y17610	Y11405*/UC Canario707	16	19.9	55.5	39.0	99.0	1.5	52.0	4.0
Y17618	Y11405*/UC Canario707	18	18.2	54.2	39.0	95.0	2.0	51.5	4.5
I17508	**MY 06326**	21	18.0	41.7	40.0	93.0	3.0	44.0	3.0
Y17612	Y11405*/UC Canario707	15	17.4	44.6	40.0	94.0	1.0	50.0	4.0
MEAN(24)			22.6	47.6	38.5	93.8	1.6	49.5	4.4
LSD(.05)			3.1	1.9	1.3	4.1	0.6	2.3	0.8
CV%			11.6	3.4	2.0	2.5	21.0	2.7	10.5

EXPERIMENT 8216 PRELIMINARY KIDNEY BEAN YIELD TRIAL								PLANTED: 6/12/18	
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE
K08961	K04604/USDK-CBB-15, **SNOWDON**	44	31.2	68.3	33.0	90.0	1.0	49.5	5.0
K18301	K11306/K15303	1	30.7	45.9	42.0	94.0	2.5	51.0	4.5
K18907	K08961/I15701	29	30.6	55.6	39.0	92.0	1.5	48.5	4.5
K18910	K08961/I15701	32	30.4	50.2	35.0	90.0	1.0	49.0	4.5
K18915	K08961/K15302	37	30.4	54.3	40.0	97.0	2.0	52.0	5.0
K18504	K15304/I15619	21	29.9	54.4	48.0	100.0	2.5	53.0	3.5
K18501	K11306/I13421	18	29.3	52.6	41.0	94.0	2.0	52.0	4.5
K01234	Mutant of Red Hawk, **REDCOAT**	48	29.0	60.6	36.0	97.0	1.5	50.5	5.0
K18914	K08961/K15302	36	29.0	54.7	39.0	94.0	2.0	51.5	5.5
K18905	K08961/I15701	27	28.5	54.1	36.0	90.0	2.5	49.0	4.5
K18902	K08961/I15701	24	27.9	49.9	40.0	96.0	2.0	49.0	5.0
K18904	K08961/I15701	26	27.7	59.4	34.0	92.0	2.0	48.5	5.0
K18912	K08961/I15701	34	27.6	60.3	35.0	91.0	1.0	48.5	4.5
K18313	I13420/K11306	13	27.5	49.3	41.0	97.0	2.0	51.5	4.5
K18903	K08961/I15701	25	27.3	49.6	39.0	96.0	2.0	48.5	5.0
K18908	K08961/I15701	30	27.2	54.4	36.0	88.0	1.5	48.0	4.5
I13421	ND061106, **ROSIE**	46	27.2	52.2	42.0	99.0	2.0	52.0	4.0
K18314	I13420/K11306	14	27.0	51.2	41.0	96.0	1.0	53.0	4.5
I11201	Pink Panther//ZAA/Montcalm, **CLOUSEAU**	45	27.0	73.1	34.0	90.0	1.0	48.5	3.5
K18503	K11306/I13421	20	26.9	49.4	41.0	94.0	1.5	52.0	4.5
K18906	K08961/I15701	28	26.8	53.6	36.0	91.0	2.0	49.0	4.5
K90101	CHAR/2*MONT, **RED HAWK**	41	26.6	59.2	37.0	94.0	1.0	50.5	4.5
K18303	K11306/I15622	3	25.8	51.8	41.0	92.0	2.5	49.0	4.0
K18911	K08961/I15701	33	25.3	48.1	34.0	89.0	1.0	47.5	4.5
K11306	K06621/USDK-CBB-15, **RED CEDAR**	42	25.1	49.8	38.0	92.0	1.0	50.5	5.0
K18312	K11306/K14104	12	25.0	54.3	40.0	93.0	1.5	50.5	4.0
K18302	K11306/I15622	2	24.6	59.6	39.0	94.0	1.5	50.0	5.0
K18311	K11306/K14104	11	24.4	49.5	40.0	95.0	2.0	50.0	4.0
K18309	K11306/I13420	9	24.3	50.8	42.0	93.0	2.0	50.5	4.5
K18909	K08961/I15701	31	24.2	49.8	35.0	89.0	1.5	48.5	4.5

EXPERIMENT 8216 PRELIMINARY KIDNEY BEAN YIELD TRIAL								PLANTED: 6/12/18	
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**
K18901	K08961/I15701	23	23.8	62.8	38.0	98.0	2.0	50.0	4.5
K18916	K15901/K15302	38	23.6	53.9	43.0	95.0	2.0	53.5	5.0
K18917	I13420/K12803	39	23.6	51.6	35.0	94.0	2.0	49.0	4.0
K18307	K11306/K15304	7	23.4	51.2	39.0	91.0	1.0	50.0	4.5
K90902	BEA/50B1807//LASSEN, **BELUGA**	43	23.3	57.6	41.0	98.0	2.0	52.0	4.0
K18317	I13420/K11306	17	22.8	49.9	38.0	95.0	1.5	51.5	4.5
K18919	I13420/K12803	40	22.7	53.9	40.0	95.0	1.0	52.0	5.0
K18502	K11306/I13421	19	22.4	50.6	41.0	91.0	1.5	50.0	4.0
K18316	I13420/K11306	16	22.3	45.1	39.0	96.0	1.5	51.5	4.5
I11234	Drake//ZAA/Montcalm, **RED ROVER**	47	22.0	57.0	38.0	93.0	2.0	50.5	4.0
K18304	K11306/I15622	4	21.8	53.2	39.0	93.0	1.0	50.5	4.5
K18913	K08961/I15701	35	21.8	52.2	34.0	89.0	1.0	49.0	5.0
K18505	K15304/I15619	22	21.3	60.1	36.0	96.0	2.0	51.5	4.0
K18306	K11306/I15622	6	21.0	51.6	39.0	90.0	1.0	49.5	4.5
K18315	I13420/K11306	15	20.3	49.7	42.0	96.0	1.5	52.5	4.0
K18310	K11306/I13420	10	20.3	48.2	41.0	91.0	1.5	50.0	4.0
K18305	K11306/I15622	5	19.7	50.2	39.0	91.0	1.0	49.0	4.0
K18308	K11306/I13420	8	19.6	49.1	40.0	91.0	1.0	50.5	4.5
MEAN(48)			25.4	53.6	38.4	93.1	1.6	50.3	4.5
LSD(.05)			3.9	1.4	2.0	2.3	0.7	1.6	0.9
CV%			11.3	1.9	3.1	1.5	25.7	1.9	11.5

EXPERIMENT 8217 IOWA STATE SEED NUTRIENT YIELD TRIAL			PLANTED: 6/12/18			
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**Stand (Plants)**
I03390	ND9902621-2, **ECLIPSE**	3	42.4	23.6	39.0	96.0
I17509	**TAURUS**	2	31.0	40.9	42.0	108.0
I17508	**MY 06326**	4	26.4	47.6	40.0	96.0
K74002	MDRK/CN(3)-HBR(NEB#1), **MONTCALM**	1	23.0	59.2	39.0	67.3
MEAN(4)			30.7	42.8	39.8	91.8
LSD(.05)			2.6	0.6	0.5	19.3
CV%			5.3	0.9	0.8	13.2

EXPERIMENT 8218 NATIONAL WHITE MOLD YIELD TRIAL								PLANTED: 6/26/18			
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE	WM (1-9)	WM %
R17604	R12859/R12844	32	36.1	34.7	45.0	94.0	1.5	54.0	6.0	2.7	29.6
P16901	Eldorado/P11519	27	35.8	40.2	47.0	96.0	2.5	52.5	5.7	2.7	29.6
B17691	B14311/B12724	24	35.2	22.5	44.0	96.0	1.0	55.0	5.0	4.0	44.4
P16905	P11519/P12610	28	35.1	39.7	45.0	96.0	2.0	53.5	5.7	3.7	40.7
R17603	R12859/R12844	31	34.7	35.4	44.0	94.0	1.0	55.0	6.0	3.3	37.0
I13401	SR 09303, **VIPER**	30	32.9	29.7	43.0	93.0	2.5	50.5	4.0	7.0	77.8
N14229	N11275/N11256	4	32.4	18.2	45.0	98.0	2.0	53.5	5.7	3.0	33.3
B16504	Zenith//Alpena*/B09197	5	30.6	20.5	43.0	96.0	2.0	51.5	4.7	5.7	63.0
G17410	G13467/G13479	26	30.5	35.7	41.0	97.0	1.0	52.0	6.0	3.0	33.3
G16351	Eldorado/G13467	25	29.4	37.4	43.0	97.0	1.5	52.5	5.7	3.7	40.7
B15430	Zenith/B12721	19	29.3	26.1	41.0	97.0	1.0	52.5	5.0	3.7	40.7
R12844	SR9-5/R09508, **CAYENNE**	29	29.0	34.8	42.0	94.0	1.5	53.0	5.0	5.7	63.0
B10244	B04644/ZORRO, **ZENITH**	17	28.9	23.4	43.0	97.0	2.0	52.0	5.3	5.3	59.3
I18618	PT11-13B	6	27.2	38.9	44.0	93.0	2.5	50.5	4.3	5.3	59.3
B18504	Zenith//Alpena*/B09197	21	27.0	20.5	43.0	92.0	2.0	50.5	5.0	6.3	70.4
I11264	COOP 03019, MERLIN	14	25.8	19.7	44.0	98.0	1.5	54.5	5.0	2.0	22.2
N17504	N14206/N14229	15	25.7	19.3	45.0	98.0	2.0	54.0	5.3	3.0	33.3
N17506	N14230/N12447	16	25.1	19.9	44.0	97.0	1.0	53.5	6.0	3.3	37.0
N11283	MEDALIST/N08003, **ALPENA**	13	24.8	19.0	44.0	97.0	1.0	54.0	4.7	6.0	66.7
I15652	ND121630	11	23.9	35.8	42.0	93.0	2.5	50.5	3.7	7.0	77.8
I18629	PRP-153	10	23.8	37.2	43.0	99.0	3.0	44.5	3.3	6.0	66.7
B17536	B14311/B10244	23	22.4	18.8	42.0	96.0	1.0	50.0	4.3	4.3	48.2
B04554	B00103*/X00822, **ZORRO**	18	22.0	23.1	42.0	98.0	2.0	53.5	5.7	3.3	37.0
B17220	B10244/B12724	22	18.4	23.5	44.0	94.0	1.0	52.5	5.3	3.3	37.0
I17551	SR16-5	8	17.6	39.5	39.0	91.0	1.0	49.0	3.0	6.0	66.7
B16501	Zenith/B10215	20	17.3	18.8	44.0	93.0	1.0	51.0	4.3	5.7	63.0
I17550	NDZ14083	7	16.4	37.1	39.0	92.0	3.0	44.5	3.3	6.0	66.7
I18628	VCP-13	9	11.8	37.9	46.0	103.0	3.5	45.0	3.0	2.0	22.2
I81010	JAPON3/MAGDALENE, **BUNSI**	3	11.1	19.2	39.0	97.0	3.0	45.5	3.3	7.0	77.8
I96417	**G122**	1	10.6	40.5	40.0	103.0	2.0	45.5	2.7	3.7	40.7
I89011	RB, **BERYL**	2	7.4	30.2	39.0	90.0	4.0	40.0	3.0	8.7	96.3
I16705	ND121448	12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MEAN(32)			25.1	28.9	42.6	95.6	1.9	50.8	4.7	4.6	51.0
LSD(.05)			4.4	1.7	2.2	2.9	0.6	4.3	0.9	1.8	20.5
CV%			12.8	4.3	3.0	1.8	20.2	5.0	14.5	29.4	29.4

EXPERIMENT 8420 YDI YIELD TRIAL-WITH FERTILIZER/NON-INOCULATED								PLANTED: 6/26/18	
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**
B16504	Zenith//Alpena*/B09197	20	43.2	23.3	42.0	101.0	2.5	49.0	4.5
B18504	Zenith//Alpena*/B09197	21	41.4	23.0	42.0	101.0	1.0	52.5	5.5
B11519	I82054/B07554	1	41.0	23.0	46.0	102.0	2.5	49.0	4.0
B11588	I82054/B07554	12	40.4	25.8	42.0	104.0	2.0	47.5	3.0
B11602	I82054/B07554	14	39.8	27.4	42.0	103.0	2.5	47.0	3.0
B04554	B00103*/X00822, **ZORRO**	24	39.7	22.9	42.0	101.0	2.0	50.0	4.0
B10244	B04644/ZORRO, **ZENITH**	25	39.2	22.8	42.0	100.0	1.5	50.0	5.5
B16501	Zenith/B10215	22	38.3	22.4	42.0	101.0	1.0	52.0	6.0
B11552	I82054/B07554	5	37.8	23.5	43.0	108.0	3.0	47.5	3.0
B17220	B10244/B12724	23	37.8	22.6	42.0	99.0	1.5	50.5	5.0
B11611	I82054/B07554	15	37.7	23.2	42.0	103.0	2.0	47.5	3.0
B11530	I82054/B07554	3	37.3	24.3	41.0	103.0	2.0	50.5	3.5
B11617	I82054/B07554	16	37.1	23.0	42.0	102.0	1.0	47.5	3.5
B11536	I82054/B07554	4	37.0	25.1	42.0	101.0	3.5	45.5	3.0
B11567	I82054/B07554	7	36.1	24.8	43.0	102.0	3.0	44.5	3.0
I11264	COOP 03019, **MERLIN**	26	35.0	21.2	41.0	104.0	1.5	52.0	4.5
B11555	I82054/B07554	6	34.6	23.8	41.0	107.0	3.0	45.5	2.5
B11586	I82054/B07554	11	34.1	24.0	42.0	102.0	1.5	50.5	4.0
B11594	I82054/B07554	13	34.0	24.7	42.0	101.0	2.5	46.0	3.0
B11571	I82054/B07554	8	33.3	22.6	44.0	105.0	1.5	50.5	3.5
N17506	N14230/N12447	19	33.2	20.9	46.0	99.0	1.0	53.0	6.0
B11521	I82054/B07554	2	32.4	23.4	42.0	109.0	4.0	45.5	2.5
B11582	I82054/B07554	10	32.2	20.3	43.0	102.0	1.5	50.0	4.0
N14229	N11275/N11256	17	31.8	18.3	43.0	98.0	1.0	53.0	6.0
N17504	N14206/N14229	18	31.6	18.9	42.0	100.0	1.0	52.0	5.0
B11580	I82054/B07554	9	29.9	23.7	45.0	107.0	2.5	47.5	3.0
MEAN(26)		0	36.4	23.0	42.3	102.3	2.0	49.1	4.0
LSD(.05)		0	4.7	1.2	1.6	2.7	0.9	3.0	1.1
CV%		0	7.5	3.0	2.2	1.6	26.6	3.5	16.1

EXPERIMENT 8422 YDI YIELD TRIAL-NO FERTILIZER/INOCULATED								PLANTED: 6/26/18	
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**
B16504	Zenith//Alpena*/B09197	20	39.0	22.9	42.0	102.0	1.5	52.0	5.5
B11519	I82054/B07554	1	35.2	20.9	46.0	104.0	2.0	48.5	3.5
B11571	I82054/B07554	8	34.8	23.7	44.0	109.0	2.0	49.0	3.0
B11586	I82054/B07554	11	34.7	25.1	43.0	103.0	1.0	50.0	4.0
B11567	I82054/B07554	7	34.5	25.1	45.0	104.0	3.0	46.0	3.0
N17506	N14230/N12447	19	34.0	21.3	46.0	101.0	1.0	51.0	4.5
B04554	B00103*/X00822, **ZORRO**	24	33.7	22.7	41.0	103.0	1.5	51.0	5.0
B11602	I82054/B07554	14	33.6	26.9	43.0	102.0	2.5	46.5	3.0
B11536	I82054/B07554	4	33.4	22.6	42.0	102.0	2.5	47.5	3.0
B11594	I82054/B07554	13	33.3	24.7	42.0	104.0	2.0	48.0	4.0
B11588	I82054/B07554	12	32.9	25.9	42.0	104.0	1.5	49.5	4.0
B10244	B04644/ZORRO, **ZENITH**	25	32.8	23.4	42.0	100.0	1.5	51.0	5.5
B11582	I82054/B07554	10	32.6	20.3	46.0	105.0	1.5	50.5	4.0
B11580	I82054/B07554	9	31.8	23.3	47.0	107.0	2.5	48.5	3.0
B18504	Zenith//Alpena*/B09197	21	31.7	22.3	42.0	101.0	1.0	52.0	5.5
B11552	I82054/B07554	5	30.4	23.1	44.0	107.0	2.5	49.0	3.0
B17220	B10244/B12724	23	30.4	22.9	41.0	99.0	1.0	50.0	4.5
N14229	N11275/N11256	17	30.0	18.7	43.0	100.0	1.0	52.5	6.0
B11617	I82054/B07554	16	29.8	22.0	41.0	102.0	1.0	48.5	4.0
B11555	I82054/B07554	6	29.7	23.3	41.0	106.0	2.5	48.0	3.0
I11264	COOP 03019, **MERLIN**	26	29.3	20.0	42.0	106.0	1.5	53.5	4.0
B11530	I82054/B07554	3	28.7	24.1	41.0	107.0	1.5	49.5	4.0
N17504	N14206/N14229	18	28.5	19.1	44.0	98.0	1.0	50.5	5.5
B11611	I82054/B07554	15	28.4	23.8	42.0	107.0	1.0	49.0	3.5
B16501	Zenith/B10215	22	26.4	22.8	42.0	100.0	1.0	51.0	5.5
B11521	I82054/B07554	2	25.2	21.3	42.0	107.0	3.0	46.5	3.0
MEAN(26)			31.7	22.8	42.7	103.1	1.7	49.6	4.1
LSD(.05)			4.7	1.4	1.8	3.6	0.9	2.1	0.9
CV%			8.7	3.5	2.5	2.0	31.9	2.5	12.4

Timing of glyphosate and preharvest treatment effects on two classes of dry beans

Christy Sprague, Gary Powell and Brian Stiles, Michigan State University

Location:	Richville (SVREC)	**Tillage:**	Conventional
Planting Date:	June 19, 2018	**Row width:**	30-inch
Replicated:	4 times	**Soil Type:**	Sandy clay loam, 2.5% OM, pH 7.7
Varieties:	'Zenith' black beans	**Populations:**	109,000 seeds/A
	'Merlin' navy beans		109,000 seeds/A

Table 1. Preharvest treatments on leaf and stem desiccation (%) 4, 8, 14 days after treatment (DAT).

	Zenith					Merlin				
		8 DAT		14 DAT			8 DAT		14 DAT	
Treatments	**4 DAT**	**leaf**	**stem**	**leaf**	**stem**	**4 DAT**	**leaf**	**stem**	**leaf**	**stem**
Sharpen (1 fl oz) + MSO + AMS	100 a[a]	100 a	100 a	100 a	100 a	100 a	100 a	96 a	100 a	99 a
Sharpen (2 fl oz) + MSO + AMS	100 a	100 a	100 a	100 a	100 a	99 a	100 a	98 a	100 a	100 a
Gramoxone (2 pt) + NIS	99 a	100 a	99 a	100 a	100 a	95 a	99 a	84 b	100 a	95 b
Sharpen (1 fl oz) + Gramox.+ MSO + AMS	99 a	100 a	98 a	100 a	100 a	98 a	100 a	91 a	100 a	97 ab
Roundup (22 fl oz) + AMS	95 a	100 a	100 a	100 a	100 a	87 b	100 a	84 b	100 a	100 a
Untreated	75 b	78 b	81 b	95 b	92 b	68 c	80 b	58 c	89 b	73 c

[a] Means within a column with different letters are significantly different from each other.

Summary: There were two objectives to this study this year using two dry bean classes, 'Zenith' black bean (uniform dry down) and 'Merlin' navy bean (green stem). The first objective was to evaluate the effect of glyphosate application timing on glyphosate residues remaining in harvested seed. Due to the overall concerns from dry bean buyers on the use of glyphosate, this objective was conducted to provide some actual data on the potential for glyphosate residues. Preharvest applications of glyphosate were made at five different dry bean stages ranging from 30% to >95% yellow pods. Dry beans were sampled and are currently being analyzed for residues. The second objective was to evaluate the effects of the most popular preharvest treatments on dry bean leaf and stem desiccation. Treatments were applied when ~70% of the pods were yellow. There were no differences in the desiccation treatments for Zenith black beans at any of the evaluation timings (Table 1). Differences were detected for desiccation of Merlin navy beans. Desiccation with glyphosate (Roundup), which is currently not recommended due to dry bean buyer concerns with residues, was slower than the other treatments for maximum desiccation. Additionally, stem desiccation with Gramoxone alone was not as effective as some of the other treatments, but was still 95%. This combined with previous research trials, show some general trends. Sharpen applied at 1 fl oz/A is similar 2 fl oz/A rate, regardless of variety. The speed of effectiveness on desiccation is dependent on the year, but over four years, Sharpen or Sharpen tank-mixtures provide the most consistent bean desiccation 7 DAT, followed by Gramoxone. The biggest concern is with yield, when quick acting herbicides are applied prior to 80% of the pods being yellow, we do see reductions in yield. This label recommendation must always be followed. Overall, many of the treatments provided good bean desiccation. This research was supported by the Michigan Dry Bean Commission through the Michigan Department of Agriculture Specialty Crops grant.

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan State University AgBioResearch

Harvest aid effects on common lambsquarters and dry bean desiccation

Christy Sprague, Gary Powell and Brian Stiles, Michigan State University

Location: Richville (SVREC)	**Tillage:** Conventional
Planting Date: June 19, 2018	**Row width:** 30-inch
Replicated: 4 times	**Soil Type:** Sandy clay loam, 2.5% OM, pH 7.7
Varieties: 'Merlin' navy beans	**Date Treated:** Sept. 27 & Oct. 3, 2018

Table 1. Effect of preharvest treatments on common lambsquarters and dry bean desiccation.

	C. lambsquarters		'Merlin' navy bean	
Treatments	**6 DAT**	**12 DAT**	**6 DAT**	**12 DAT**
Sharpen (1 fl oz) + MSO + AMS	61 de[a]	70 d-f	100 a	100 a
Sharpen (2 fl oz) + MSO + AMS	71 de	73 c-e	100 a	100 a
Gramoxone (2 pt) + NIS	91 ab	91 a-c	96 ab	100 a
Valor (1.5 oz) + MSO	68 de	77 c-e	100 a	100 a
Roundup (22 fl oz) + AMS	75 b-e	85 a-c	92 b	100 a
Aim (2 fl oz) + MSO	61 de	58 g	99 a	100 a
Sharpen (1 oz) + Roundup + MSO +AMS	90 a-c	84 a-c	100 a	100 a
Sharpen (1 oz) + Gramox. + MSO + AMS	90 a-c	98 a	100 a	100 a
Valor (1.5 oz) + Roundup + MSO +AMS	78 b-d	82 b-d	100 a	100 a
Valor (1.5 oz) + Gramox. + MSO + AMS	96 a	97 a	99 a	100 a
Aim (2 fl oz) + Roundup + MSO +AMS	76 b-d	80 cd	100 a	100 a
Aim (2 fl oz) + Gramox. + MSO + AMS	93 ab	96 ab	100 a	100 a
Sharpen (1 fl oz) + MSO + AMS fb. Sharpen (1 fl oz) + MSO + AMS	73 c-e	84 a-c	100 a	100 a
Gramoxone (2 pt) + NIS fb. Sharpen (1 fl oz) + MSO + AMS	93 ab	95 ab	94 ab	100 a
Roundup (22 fl oz) + AMS fb. Sharpen (1 fl oz) + MSO + AMS	58 e	65 f	83 b	100 a
Untreated	39 f	40 h	80 b	76 b

[a] Means within a column with different letters are significantly different from each other

Summary: This study was conducted to evaluate the effects of preharvest herbicide treatments on weed and bean desiccation. We have been looking at common lambsquarters desiccation and have evaluated Powell amaranth desiccation previously. This year we also included three sequential applications timed six days apart. In the past, Gramoxone, Roundup (glyphosate) or combinations with these herbicides have provided the greatest common lambsquarters desiccation. This year Gramoxone alone, Gramoxone combinations or sequential applications with Gramoxone were the most consistent for common lambsquarters desiccation. Sequential applications did not improve common lambsquarters desiccation. Over the years if you are trying desiccate weeds, including Gramoxone in preharvest treatment has been the most consistent. In this trial dry beans were further along >90% yellow pods, so most all treatments were excellent in dry bean desiccation. Please refer to the 2019 MSU Weed Control Guide (E-434) for recommendations for the different preharvest herbicide treatments available in dry bean. This research was supported by the Michigan Dry Bean Commission through the Michigan Department of Agriculture Specialty Crops grant.

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan State University AgBioResearch

Sensitivity of two classes of dry beans to plant growth regulator herbicides

Scott Bales and Christy Sprague, Michigan State University

Location:	Richville (SVREC)	**Tillage:**	Conventional
Planting Date:	June 19, 2018	**Row width:**	30-inch
Replicated:	4 times	**Soil Type:**	Sandy Clay loam, 2.5% OM, pH 7.7
Varieties:	'Zenith' black beans	**Populations:**	109,000 seeds/A
	'Merlin' navy beans		109,000 seeds/A

Table 1. Sub-lethal rates of plant growth regulator herbicides effects on dry bean injury 28 days after treatment (DAT), maturity and yield.

		Injury[b]		Delayed maturity		Yield	
Herbicide	**Rate[a]**	**V2**	**V8**	**V2**	**V8**	**V2**	**V8**
Dicamba	0.1	0 a[c]	6 c	0 a[d]	0 a	33.0 c-e[e]	34.8 a-d
	1.0	4 b	12 d	6 b	9 b	32.5 d-f	29.9 f
	10	27 e	58 f	16 c	20 c	22.6 g	16.3 h
2,4-D Choline	0.1	0 a	0 a	0 A	0 A	36.9 a	35.7 a-c
	1.0	0 a	0 a	0 A	2 B	34.7 a-d	36.6 a
	10	1 a	4 b	4 C	11 C	36.0 ab	30.8 ef
Untreated	-	-	-	-	-	33.5 b-e	35.4 a-d

[a] Rate is a % of 0.5 lb ae/A of dicamba and 1.0 lb ae/A of 2,4-D.
[b] Injury, maturity and yield are combined over dry bean class.
[c] Means within each outlined area with different letters are significantly different from each other.
[d] Days past the untreated control to reach 50% maturity. The larger the number the greater delay in maturity.
[e] Yield is in cwt/A obtained by direct harvest and adjusted to 18% moisture.

Summary: With the recent commercialization of soybean resistant to dicamba (Xtend soybean) and the upcoming release of soybean resistant to 2,4-D (Enlist soybean) a study was conducted to investigate the effects of off-target exposure of dicamba and 2,4-D on two classes of dry edible bean. The objective of this research was to gain a better understanding of how dry edible beans respond to sub-lethal doses of these PGR herbicides. 'Zenith' black bean and 'Merlin' navy bean were exposed to the PGR herbicides at the V2 and preflower (V8) stages. Dry bean varieties responded similarly to exposure of dicamba and 2,4-D. Exposure to dicamba always caused more injury and caused greater delays in dry bean maturity. Even with delays in maturity dry bean yield was only lower compared with the untreated when beans were exposed to 1% dicamba treatments at V8 stages, and 10% dicamba treatments at both timings. We have conducted this study in three other environments. Plant injury was similar between all locations. In 2018 untreated control treatments at SVREC yielded 39% more than other locations. However, 10% dicamba treatments reduced yield 37% more at SVREC in 2018 than other locations. The delays in harvest also may greatly effect yield of other treatments in the future. We are currently looking at the effects of this injury on different aspects of the progeny seed (seed size and germination).

Tank-contamination of dicamba in dry edible beans

Trial ID: DB01-18 Study Dir.: Bales, Sprague
Conducted: SVREC Investigator: Christy Sprague

Planting Date:	Jun-19-2018	**Row Spacing:**	30 IN
Variety:	'Zenith' black bean	**No. of Reps:**	4
Population:	109000 seeds/A	**% OM:**	2.5
Soil Type:	SCL sandy clay loam	**pH:**	7.7
Plot Size:	10 X 35 FT	**Study Design:**	Randomized Complete Block (RCB)

Tillage/Previous Crops: Fall primary tillage followed by spring soil finish
Fertilizer:

Crop and Weed Description

Weed	Code	Common Name	Scientific Name
1			

Crop	Code	Common Name
1	PHSVX	Dry edible bean

Application Description

	A	B
Application Timing:	V2 POST	V5 POST
Date Treated:	Jul-11-2018	Jul-18-2018
Time Treated:	12:15 PM	10:00 AM
% Cloud Cover:	5	0
Air Temp., Unit:	78 F	73 F
% Relative Humidity:	46	63
Wind Speed/Unit/Dir:	7 mph N	3 mph W
Soil Temp, Unit:	78 F	72 F
Leaf Moist/Dew Presence (Y/N):	5	4
Soil Moist:	4	4

Crop Stage at Each Application

	A	B
Crop 1 Name:	PHSVX	PHSVX
Height:	6 "	12 "
Stage:	V2	V5-V6

Weed Stage at Each Application

	A	B
Weed 1 Name:		
Height:		
Stage:		

Application Equipment

Appl	Sprayer Type	Ground Speed	Nozzle Type	Nozzle Size	Nozzle Height	Nozzle Spacing	Boom Width	Spray Volume	Carrier	Operation Pressure
A	CUB	3.8 mph	AIXR	11003	14 "	20 "	100 "	19 GPA	WATER	30 PSI
B	CUB	3.8 mph	AIXR	11003	27 "	20 "	100 "	19 GPA	WATER	30 PSI

Comments:

Michigan State University

Tank-contamination of dicamba in dry edible beans
Trial ID: DB01-18 Location: SVREC Trial Year: 2018
Protocol ID: DB 03-18 Investigator: Christy Sprague
Study Director: Bales, Sprague

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	PHSVX injury percent 7 DAT	PHSVX injury percent 14 DAT	PHSVX injury percent 21 DAT	PHSVX injury percent 28 DAT	PHSVX moisture percent	PHSVX yield cwt/acre at 18% M
	Pest Code												
	Crop Code							PHSVX	PHSVX	PHSVX	PHSVX	PHSVX	PHSVX
	Rating Date												
	Rating Type							injury	injury	injury	injury	moisture	yield
	Rating Unit							percent	percent	percent	percent	percent	cwt/acre
	Trt-Eval Interval							7 DAT	14 DAT	21 DAT	28 DAT		at 18% M
	Number of Decimals							0	0	0	0	1	1
1	Untreated							0	0	0	0	17.7	36.8
2	Raptor	1	L	4	fl oz/a	POST-V2	A	0	0	0	0	17.2	35.4
2	Basagran	4	L	16	fl oz/a	POST-V2	A						
2	Crop oil concentrate		L	1	% v/v	POST-V2	A						
2	AMS		WG	2.5	lb/a	POST-V2	A						
3	Reflex	2	L	1	pt/a	POST-V2	A	0	0	0	0	17.1	31.3
3	Crop oil concentrate		L	1	% v/v	POST-V2	A						
4	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V2	A	15	16	15	4	17.5	33.5
5	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V2	A	17	21	22	8	17.6	30.3
5	Raptor	1	L	4	fl oz/a	POST-V2	A						
5	Basagran	4	L	16	fl oz/a	POST-V2	A						
5	Crop oil concentrate		L	1	% v/v	POST-V2	A						
5	AMS		WG	2.5	lb/a	POST-V2	A						
6	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V2	A	19	19	20	6	17.7	32.2
6	Reflex	2	L	1	pt/a	POST-V2	A						
6	Crop oil concentrate		L	1	% v/v	POST-V2	A						
7	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V2	A	19	19	16	6	17.7	34.3
7	Roundup PowerMax (1%)	4.5	SL	0.30	fl oz/a	POST-V2	A						
8	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V2	A	23	25	25	9	17.7	29.8
8	Roundup PowerMax (1%)	4.5	SL	0.30	fl oz/a	POST-V2	A						
8	Raptor	1	L	4	fl oz/a	POST-V2	A						
8	Basagran	4	L	16	fl oz/a	POST-V2	A						
8	Crop oil concentrate		L	1	% v/v	POST-V2	A						
8	AMS		WG	2.5	lb/a	POST-V2	A						
9	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V2	A	24	24	22	8	17.5	32.0
9	Roundup PowerMax (1%)	4.5	SL	0.30	fl oz/a	POST-V2	A						
9	Reflex	2	L	1	pt/a	POST-V2	A						
9	Crop oil concentrate		L	1	% v/v	POST-V2	A						
10	Untreated							0	0	0	0	17.8	36.6
11	Raptor	1	L	4	fl oz/a	POST-V5	B	0	0	0	0	17.1	35.6
11	Basagran	4	L	16	fl oz/a	POST-V5	B						
11	Crop oil concentrate		L	1	% v/v	POST-V5	B						
11	AMS		WG	2.5	lb/a	POST-V5	B						
12	Reflex	2	L	1	pt/a	POST-V5	B	0	0	0	0	19.2	37.1
12	Crop oil concentrate		L	1	% v/v	POST-V5	B						
13	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V5	B	14	17	15	5	18.3	30.8

Michigan State University

Tank-contamination of dicamba in dry edible beans
Trial ID: DB01-18 Location: SVREC Trial Year: 2018
Protocol ID: DB 03-18 Investigator: Christy Sprague
Study Director: Bales, Sprague

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	PHSVX injury percent 7 DAT 0	PHSVX injury percent 14 DAT 0	PHSVX injury percent 21 DAT 0	PHSVX injury percent 28 DAT 0	PHSVX moisture percent 1	PHSVX yield cwt/acre at 18% M 1
14	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V5	B	16	18	18	7	18.4	29.7
14	Raptor	1	L	4	fl oz/a	POST-V5	B						
14	Basagran	4	L	16	fl oz/a	POST-V5	B						
14	Crop oil concentrate		L	1	% v/v	POST-V5	B						
14	AMS		WG	2.5	lb/a	POST-V5	B						
15	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V5	B	19	21	17	7	18.1	28.3
15	Reflex	2	L	1	pt/a	POST-V5	B						
15	Crop oil concentrate		L	1	% v/v	POST-V5	B						
16	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V5	B	19	20	18	5	17.9	32.7
16	Roundup PowerMax (1%)	4.5	SL	0.30	fl oz/a	POST-V5	B						
17	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V5	B	21	21	20	9	18.1	28.6
17	Roundup PowerMax (1%)	4.5	SL	0.30	fl oz/a	POST-V5	B						
17	Raptor	1	L	4	fl oz/a	POST-V5	B						
17	Basagran	4	L	16	fl oz/a	POST-V5	B						
17	Crop oil concentrate		L	1	% v/v	POST-V5	B						
17	AMS		WG	2.5	lb/a	POST-V5	B						
18	XtendiMax (1%)	2.9	L	0.22	fl oz/a	POST-V5	B	24	24	20	9	17.7	28.4
18	Roundup PowerMax (1%)	4.5	SL	0.30	fl oz/a	POST-V5	B						
18	Reflex	2	L	1	pt/a	POST-V5	B						
18	Crop oil concentrate		L	1	% v/v	POST-V5	B						
LSD P=.05								2.2	2.4	2.5	2.2	0.74	4.13
Standard Deviation								1.6	1.7	1.7	1.6	0.52	2.91
CV								12.35	11.87	13.75	34.98	2.94	8.91

MSU Weed Science Research Program

Comparison of imazomox formulations in dry edible beans

Trial ID: DB05-18 Study Dir.: Sprague, Powell, Stiles
Conducted: SVREC Investigator: Christy Sprague

Planting Date: Jun-19-2018
Variety: 'Zenith' black bean
Population: 106000 seeds/A
Soil Type: CL clay loam
Plot Size: 10 X 30 FT
Row Spacing: 30 IN
No. of Reps: 4
% OM: 3.0
pH: 7.9
Study Design: Randomized Complete Block (RCB)

Tillage/Previous Crops: Fall primary tillage followed by spring soil finish
Fertilizer: 130 lb/A (60 lb/A N) of urea was broadcast and incorporated prior to planting.

Crop and Weed Description

Weed	Code	Common Name	Scientific Name
1	CHEAL	lambsquarters, common	Chenopodium album
2	AMAPO	amaranth, Powell	Amaranthus powellii
Crop	**Code**	**Common Name**	
1	PHSVX	Dry Edible Bean	

Application Description

	A
Application Timing:	POST
Date Treated:	Jul-11-2018
Time Treated:	11:45 AM
% Cloud Cover:	5
Air Temp., Unit:	76 F
% Relative Humidity:	46
Wind Speed/Unit/Dir:	7 mph N
Soil Temp, Unit:	78 F
Leaf Moist/Dew Presence (Y/N):	5
Soil Moist:	4

Crop Stage at Each Application

	A
Crop 1 Name:	PHSVX
Height:	4-6 " (5)
Stage:	3-4L

Weed Stage at Each Application

	A
Weed 1 Name:	CHEAL
Height:	2-14 " (8)
Stage:	8-12L
Weed 2 Name:	AMAPO
Height:	1-2 " (1.5)
Stage:	4-6L

Application Equipment

Appl	Sprayer Type	Ground Speed	Nozzle Type	Nozzle Size	Nozzle Height	Nozzle Spacing	Boom Width	Spray Volume	Carrier	Operation Pressure
A	CUB	3.8 mph	AIXR	11003	24 "	20 "	100 "	19 GAL/AC	WATER	30 PSI

Comments:

Michigan State University

Comparison of imazomox formulations in dry edible beans
Trial ID: DB05-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code					
	Pest Code								CHEAL	AMAPO		CHEAL
	Crop Code							PHSVX			PHSVX	
	Rating Date							Jul-18-2018	Jul-18-2018	Jul-18-2018	Jul-25-2018	Jul-25-2018
	Rating Type							injury	control	control	injury	control
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							7 DA-A	7 DA-A	7 DA-A	14 DA-A	14 DA-A
	Number of Decimals							0	0	0	0	0
1	KFD365-01	1	L	4	fl oz/a	POST	A	0	39	100	1	81
1	Crop oil concentrate		L	1	% v/v	POST	A					
1	AMS		WG	2.5	lb/a	POST	A					
2	Raptor	1	L	4	fl oz/a	POST	A	0	36	100	0	76
2	Crop oil concentrate		L	1	% v/v	POST	A					
2	AMS		WG	2.5	lb/a	POST	A					
3	KFD365-01	1	L	4	fl oz/a	POST	A	0	48	100	0	83
3	Broadloom	4	L	8	fl oz/a	POST	A					
3	Crop oil concentrate		L	1	% v/v	POST	A					
3	AMS		WG	2.5	lb/a	POST	A					
4	Raptor	1	L	4	fl oz/a	POST	A	0	40	100	0	83
4	Broadloom	4	L	8	fl oz/a	POST	A					
4	Crop oil concentrate		L	1	% v/v	POST	A					
4	AMS		WG	2.5	lb/a	POST	A					
5	Untreated							0	0	0	0	0
6	KFD365-01	1	L	4	fl oz/a	POST	A	0	56	100	0	93
6	Broadloom	4	L	16	fl oz/a	POST	A					
6	Crop oil concentrate		L	1	% v/v	POST	A					
6	AMS		WG	2.5	lb/a	POST	A					
7	Raptor	1	L	4	fl oz/a	POST	A	0	48	100	1	87
7	Broadloom	4	L	16	fl oz/a	POST	A					
7	Crop oil concentrate		L	1	% v/v	POST	A					
7	AMS		WG	2.5	lb/a	POST	A					
8	Varisto	4.18	L	21	fl oz/a	POST	A	0	58	100	1	91
8	Crop oil concentrate		L	1	% v/v	POST	A					
8	AMS		WG	2.5	lb/a	POST	A					
9	Raptor	1	L	3	fl oz/a	POST	A	1	61	100	1	83
9	Broadloom	4	L	16	fl oz/a	POST	A					
9	Reflex	2	L	12	fl oz/a	POST	A					
9	Crop oil concentrate		L	1	% v/v	POST	A					
9	AMS		WG	2.5	lb/a	POST	A					
10	Raptor	1	L	4	fl oz/a	POST	A	5	76	100	1	94
10	Broadloom	4	L	16	fl oz/a	POST	A					
10	Reflex	2	L	16	fl oz/a	POST	A					
10	Crop oil concentrate		L	1	% v/v	POST	A					
10	AMS		WG	2.5	lb/a	POST	A					
	LSD P=.05							1.3	5.3	.	1.4	7.9
	Standard Deviation							0.9	3.7	0.0	0.9	5.4
	CV							172.99	7.94	0.0	198.38	7.06

Could not calculate LSD (% mean diff) for columns 3,6,7,9 because error mean square = 0.

Michigan State University

Comparison of imazomox formulations in dry edible beans
Trial ID: DB05-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	AMAPO	PHSVX	CHEAL	AMAPO
	Pest Code							AMAPO		CHEAL	AMAPO
	Crop Code								PHSVX		
	Rating Date							Jul-25-2018	Aug-2-2018	Aug-2-2018	Aug-2-2018
	Rating Type							control	injury	control	control
	Rating Unit							percent	percent	percent	percent
	Trt-Eval Interval							14 DA-A	22 DA-A	22 DA-A	22 DA-A
	Number of Decimals							0	0	0	0
1	KFD365-01	1	L	4	fl oz/a	POST	A	100	0	71	100
1	Crop oil concentrate		L	1	% v/v	POST	A				
1	AMS		WG	2.5	lb/a	POST	A				
2	Raptor	1	L	4	fl oz/a	POST	A	100	0	64	100
2	Crop oil concentrate		L	1	% v/v	POST	A				
2	AMS		WG	2.5	lb/a	POST	A				
3	KFD365-01	1	L	4	fl oz/a	POST	A	100	0	86	100
3	Broadloom	4	L	8	fl oz/a	POST	A				
3	Crop oil concentrate		L	1	% v/v	POST	A				
3	AMS		WG	2.5	lb/a	POST	A				
4	Raptor	1	L	4	fl oz/a	POST	A	100	0	65	100
4	Broadloom	4	L	8	fl oz/a	POST	A				
4	Crop oil concentrate		L	1	% v/v	POST	A				
4	AMS		WG	2.5	lb/a	POST	A				
5	Untreated							0	0	0	0
6	KFD365-01	1	L	4	fl oz/a	POST	A	100	0	90	100
6	Broadloom	4	L	16	fl oz/a	POST	A				
6	Crop oil concentrate		L	1	% v/v	POST	A				
6	AMS		WG	2.5	lb/a	POST	A				
7	Raptor	1	L	4	fl oz/a	POST	A	100	0	75	100
7	Broadloom	4	L	16	fl oz/a	POST	A				
7	Crop oil concentrate		L	1	% v/v	POST	A				
7	AMS		WG	2.5	lb/a	POST	A				
8	Varisto	4.18	L	21	fl oz/a	POST	A	100	0	81	100
8	Crop oil concentrate		L	1	% v/v	POST	A				
8	AMS		WG	2.5	lb/a	POST	A				
9	Raptor	1	L	3	fl oz/a	POST	A	100	0	63	100
9	Broadloom	4	L	16	fl oz/a	POST	A				
9	Reflex	2	L	12	fl oz/a	POST	A				
9	Crop oil concentrate		L	1	% v/v	POST	A				
9	AMS		WG	2.5	lb/a	POST	A				
10	Raptor	1	L	4	fl oz/a	POST	A	100	0	87	100
10	Broadloom	4	L	16	fl oz/a	POST	A				
10	Reflex	2	L	16	fl oz/a	POST	A				
10	Crop oil concentrate		L	1	% v/v	POST	A				
10	AMS		WG	2.5	lb/a	POST	A				
	LSD P=.05							.	.	12.4	.
	Standard Deviation							0.0	0.0	8.5	0.0
	CV							0.0	0.0	12.52	0.0

Could not calculate LSD (% mean diff) for columns 3,6,7,9 because error mean square = 0.

2018 White Mold Fungicide Trial-Merrill
Giles Farm, Wheeler, Michigan

Treatment	Rate	Application Code	(1-9) Visual Rating	Incidence % Infection	Yield Pounds/Acre
UTC			4	38	3096
Propulse	10.3 oz	AB	2	14	4100
Endura	8 oz	AB	2	15	3897
Omega	8 oz	AB	2	13	3688
Heads Up	Rec.	Seed Treatment	4	41	3154
Endura+Priaxor	10.3 oz	AB	2	16	4106
Endura+Serifel	8 oz	AB	2	16	3610
Propulse	8 oz	A	2	18	3775
Endura	8 oz	A	2	15	3682
Omega	8 oz	A	2	19	3592
Omega+Endura	8+8 oz	A+B	2	17	3950
Aproach+Endura	12+8 oz	A+B	2	16	3968
Omega+Propulse	8+8 oz	A+B	2	15	3924
		LSD=.05	0.99	11.66	639
		CV=	28.23%	39.96%	12.50%

Located at Varner Farm, Midland County
Application Code:A=100% or first bloom, B=10 days after 100% bloom
Black Bear Black Beans planted in 20" rows. Population of 130,680.
Planted:June 10 Harvested: October 17
First Spray: July 26, Second Spray: August 7
Visual Rating on August 27, 1 being 0-10% and 9 being 90-100%.
Rating Date: Incidence % infection "rating" on September 18,
Sprayed with 4 row bicycle-wheel CO2 sprayer using 30 gpa at 65 psi.
Twin-Jet nozzle placed directly over the row. Plot size sprayed was 4 rows by 30 feet.
7 Irrigations of one half in per week between July 4 and August 15 as rainfall dictated.
Harvest area was middle 2 rows by 15 feet.
A field trial was conducted to determine the efficacy of various fungicide applications on
controlling white mold in Midland County. The white mold trial had eleven treatments,
a Heads Up seed treatment and one non-sprayed control with four replications of each treatment.
White mold apothecia were observed on August 14.
Field History: 2017-Cucumbers, Cover crop of Ryegrass. Sprayed Roundup to burn down
in early May. Field Cultivator Tillage on May 15. Sprayed 1.3 pints Dual and 1.6 pints Prowl H2O on May 24.
Fertilization consisted of 75 pounds of actual nitrogen from Urea. Applied on June 15.

2018 White Mold Fungicide Trial
Montcalm Research Center, Lakeview, Michigan

Treatment	Rate	Application Code	(1-9) Visual Rating	% Infection	Yield Pounds/Acre
UTC			4	48	2728
Propulse	10.3 oz	AB	2	23	3035
Endura	8 oz	AB	3	29	2937
Omega	8 oz	AB	2	23	2893
Endura+Priaxor	10.3 oz	AB	2	25	2880
Endura+Serifel	8 oz	AB	2	22	3300
Propulse	8 oz	A	3	25	3079
Endura	8 oz	A	2	20	2976
Omega	8 oz	A	3	26	2778
Omega+Endura	8+8 oz	A+B	2	21	3252
Aproach+Endura	12+8 oz	A+B	2	24	3431
Omega+Propulse	8+8 oz	A+B	2	21	3420
		LSD=.05	1.2	13	607
		CV=	31.40%	30.57%	14.56%

Application Code:A=100% or first bloom, B=10 days after 100% bloom.
Black Bear Black Beans planted in 20" rows. Population of 130,680.
Planted:June 12 Harvested: September 28.
First Spray: July 27, Second Spray: August 8.
Visual Rating on August 27, 1 being 0-10% and 9 being 90-100%.
Rating Date: Incidence % infection "rating" on September 18,
Sprayed with 4 row bicycle-wheel CO2 sprayer using 30 gpa at 65 psi.
Twin-Jet nozzle placed directly over the row. Plot size sprayed was 4 rows by 30 feet.
7 Irrigations of one half in per week between July 4 and August 15 as rainfall dictated.
Harvest area was middle 2 rows by 15 feet. Irrigated during bloom, pod setting and pod fill period.
A field trial was conducted to determine the efficacy of various fungicide applications on controlling white mold in Montcalm County. The white mold trial had eleven treatments and one non-sprayed control with four replications of each treatment.
White mold apothecia were observed on August 18.

2018 BASF Anthracnose Fungicide Trial-Merrill, Michigan

Giles Farms, Wheeler, Michigan

Treatment	Applications	Rate	28 DAT(1-9) Visual Rating	% Infection	Moisture%	Yield Pounds/Acre
UTC	1		9.0	100	28.48	1718
PRIAXOR	1	4 oz.	2.5	23	23.18	2810
		CV=	11.78%	14.92%	4.78%	10.77%
		LSD=.05	0.77	10.6	1.97	434

Zorro Black Beans planted in 20" rows. Population of 130,680.
Date Planted: June 10, Date Sprayed: July 26, Date Harvested: October 9
Inoculated with Race 73 spores on evening of first spray.
Visual Rating on August 23, 1 being 0-10% and 9 being 90-100%.
Rating Date: Incidence % infection "rating" on September 6.
CO2 sprayer using Twin-Jet nozzles at 65 psi and 30 gpa. Plot size was 4 rows by 25 feet.

Soybean tolerance to tiafenacil from preemergence applications - II

Trial ID: SOY18-18 Study Dir.: Sprague, Powell, Stiles
Conducted: SVREC Investigator: Christy Sprague

Planting Date: May-21-2018 **Row Spacing:** 30 IN
Variety: AG26X8 **No. of Reps:** 4
Population: 155000 seeds/A **% OM:** 3.0
Soil Type: CL clay loam **pH:** 7.6
Plot Size: 10 X 30 FT **Study Design:** Randomized Complete Block (RCB)

Tillage/Previous Crops: Spring soil finished twice
Fertilizer:

Crop and Weed Description

Weed	Code	Common Name	Scientific Name
1			

Crop	Code	Common Name
1	GLXMA	Soybean

Application Description

	A	B	C
Application Timing:	PRE	2 DAP	4 DAP
Date Treated:	May-21-2018	May-23-2018	May-25-2018
Time Treated:	1:30 PM	3:45 PM	8:30 AM
% Cloud Cover:	100	0	0
Air Temp., Unit:	71 F	75 F	68 F
% Relative Humidity:	34	32	59
Wind Speed/Unit/Dir:	5 mph SE	2 mph E	6 mph SW
Soil Temp, Unit:	57 F	68 F	61 F
Leaf Moist/Dew Presence (Y/N):	4	4	4
Soil Moist:	3	3	3

Crop Stage at Each Application

	A	B	C
Crop 1 Name:	GLXMA	GLXMA	GLXMA
Height:			
Stage:			

Weed Stage at Each Application

	A	B	C
Weed 1 Name:			
Height:			
Stage:			

Application Equipment

Appl	Sprayer Type	Ground Speed	Nozzle Type	Nozzle Size	Nozzle Height	Nozzle Spacing	Boom Width	Spray Volume	Carrier	Operation Pressure
A	CUB	3.8 mph	AIXR	11003	22 "	20 "	100 "	19 GPA	WATER	30 PSI
B	CUB	3.8 mph	AIXR	11003	22 "	20 "	100 "	19 GPA	WATER	30 PSI
C	CUB	3.8 mph	AIXR	11003	22 "	20 "	100 "	19 GPA	WATER	30 PSI

Comments: The trial was kept weed-free with a postemergence broadcast application of Roundup PowerMax at 32 fl oz/A + SelectMax at 9 fl oz/A + AMS at 17 lb/100 gal on June 19, 2018.

Michigan State University

Soybean tolerance to tiafenacil from preemergence applications - II
Trial ID: SOY18-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	GLXMA Jun-18-2018 injury percent 28 DA-A	GLXMA Jul-2-2018 injury percent 42 DA-A	GLXMA Jul-16-2018 injury percent 56 DA-A	GLXMA Oct-17-2018 moisture percent 149 DA-A	GLXMA Oct-17-2018 yield bu/acre at 13% M
	Pest Code											
	Crop Code							GLXMA	GLXMA	GLXMA	GLXMA	GLXMA
	Rating Date							Jun-18-2018	Jul-2-2018	Jul-16-2018	Oct-17-2018	Oct-17-2018
	Rating Type							injury	injury	injury	moisture	yield
	Rating Unit							percent	percent	percent	percent	bu/acre
	Trt-Eval Interval							28 DA-A	42 DA-A	56 DA-A	149 DA-A	at 13% M
	Number of Decimals							0	0	0	1	1
1	Tiafenacil (DCC-3825)	2.83	L	1	fl oz/a	PRE	A	0	0	0	10.6	69.8
1	MSO		L	0.5	% v/v	PRE	A					
2	Tiafenacil (DCC-3825)	2.83	L	2	fl oz/a	PRE	A	0	2	1	10.6	63.7
2	MSO		L	0.5	% v/v	PRE	A					
3	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	PRE	A	0	0	0	10.7	66.1
3	MSO		L	0.5	% v/v	PRE	A					
4	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	PRE	A	0	1	1	10.7	66.5
4	MSO		L	0.5	% v/v	PRE	A					
5	Gramoxone	2	SL	4	pt/a	PRE	A	0	0	0	10.4	63.4
5	Surfactant		L	0.25	% v/v	PRE	A					
6	Sharpen	2.85	L	1	fl oz/a	PRE	A	1	0	0	10.6	61.5
6	MSO		L	1	% v/v	PRE	A					
7	Untreated							0	0	0	10.4	60.1
8	Tiafenacil (DCC-3825)	2.83	L	1	fl oz/a	2 DAP	B	0	0	0	10.3	58.0
8	MSO		L	0.5	% v/v	2 DAP	B					
9	Tiafenacil (DCC-3825)	2.83	L	2	fl oz/a	2 DAP	B	0	0	0	10.4	55.8
9	MSO		L	0.5	% v/v	2 DAP	B					
10	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	2 DAP	B	0	0	0	10.4	58.4
10	MSO		L	0.5	% v/v	2 DAP	B					
11	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	2 DAP	B	0	1	0	10.4	60.3
11	MSO		L	0.5	% v/v	2 DAP	B					
12	Gramoxone	2	SL	4	pt/a	2 DAP	B	0	0	0	10.6	59.1
12	Surfactant		L	0.25	% v/v	2 DAP	B					
13	Sharpen	2.85	L	1	fl oz/a	2 DAP	B	0	0	0	10.4	59.9
13	MSO		L	1	% v/v	2 DAP	B					
14	Tiafenacil (DCC-3825)	2.83	L	1	fl oz/a	4 DAP	C	0	0	0	11.0	58.5
14	MSO		L	0.5	% v/v	4 DAP	C					
15	Tiafenacil (DCC-3825)	2.83	L	2	fl oz/a	4 DAP	C	0	0	0	10.3	62.5
15	MSO		L	0.5	% v/v	4 DAP	C					
16	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	4 DAP	C	0	0	0	10.8	60.5
16	MSO		L	0.5	% v/v	4 DAP	C					

Missing data estimates are included in columns:Average=1,2,3,4,5

Michigan State University

Soybean tolerance to tiafenacil from preemergence applications - II
Trial ID: SOY18-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code					
Pest Code												
Crop Code								GLXMA	GLXMA	GLXMA	GLXMA	GLXMA
Rating Date								Jun-18-2018	Jul-2-2018	Jul-16-2018	Oct-17-2018	Oct-17-2018
Rating Type								injury	injury	injury	moisture	yield
Rating Unit								percent	percent	percent	percent	bu/acre
Trt-Eval Interval								28 DA-A	42 DA-A	56 DA-A	149 DA-A	at 13% M
Number of Decimals								0	0	0	1	1
17	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	4 DAP	C	2	0	0	10.9	63.9
17	MSO		L	0.5	% v/v	4 DAP	C					
18	Gramoxone	2	SL	4	pt/a	4 DAP	C	0	0	0	10.4	58.4
18	Surfactant		L	0.25	% v/v	4 DAP	C					
19	Sharpen	2.85	L	1	fl oz/a	4 DAP	C	0	0	0	10.4	63.6
19	MSO		L	1	% v/v	4 DAP	C					
LSD P=.05								1.2	1.2	0.7	0.56	7.77
Standard Deviation								0.9	0.9	0.5	0.40	5.47
CV								527.32	455.42	530.07	3.77	8.89

Missing data estimates are included in columns:Average=1,2,3,4,5

Sugar beet activities of the USDA-ARS East Lansing conducted in cooperation with Saginaw Research & Extension Center during 2018

Mitch McGrath, Linda Hanson, Tom Goodwill, and Holly Corder
USDA – Agricultural Research Service, East Lansing, MI

Evaluation and rating plots were planted at the Saginaw Valley Research & Extension Center (SVREC) in Frankenmuth, MI in 2018 focusing on Cercospora leaf spot (CLS) and Rhizoctonia crown and root rot (CRR) disease performance of a wide range of *Beta vulgaris* materials. CLS and CRR trials were conducted in conjunction with the Beet Sugar Development Foundation (BSDF) and CLS trials included USDA-ARS cooperator germplasm as well as germplasm screening for the National Plant Germplasm System. All trials were planted following normal fall and spring tillage operations with a USDA-ARS modified John Deere / Almaco research plot planter. The BSDF CLS nursery was planted on May 1, 2018, the BSDF CRR Roundup Ready nursery was planted on May 2, 2018, and the conventional CRR nursery was planted on May 8 and 9. All plots were 15 ft long planted on 20 in rows. BSDF entries were commercial or near-commercial varieties, and weeds were controlled with glyphosate at the recommended rates. For non-commercial entries, weeds were controlled by a preemergence application of ethofumesate 10 May, followed by 4 times with mixtures of phenmedipham, desmedipham, triflusulfuron methyl, and clopyralid (May 16, 23, and 30, and June 5) and once with metolachlor (June 7). Hand weeding was done as needed to control larger weeds. The BSDF trials were thinned by hand with the generous help of Michigan Sugar Cooperative. Bolting beets were removed throughout the season. In the CLS nurseries, Quadris 2.08SC (azoxystrobin) was applied at 0.0091 kg/100 m row in a 14 cm band in-furrow at planting to help control Rhizoctonia damping-off.

Cercospora / Agronomic Nurseries:

The BSDF cooperative CLS evaluation nursery had entries from three companies, with a total of 169 entries evaluated (including 44 non-Roundup Ready entries). This nursery was 2-row with 4 replications. The nursery was inoculated on July 2 with a liquid spore suspension (approximately 1 x 10^3 spores/ml) of *Cercospora beticola*. Inoculum was produced from a mixture of leaves collected from the 2017 inoculated leaf spot nursery at the SVREC and on the Michigan State University campus farms in East Lansing, MI. Visual evaluations of the plot were conducted with a disease index (DI) on a scale from 0-10 where 0=no symptoms, 1=a few scattered spots, 2=spots coalescing or in large numbers on lower leaves only, 3= some dieback on lower leaves, but leaves not entirely dead, 4-8 are increasing amounts of dead and diseased tissue, 9= mostly dead with few remaining living leaves with large dead patches, and 10=all leaves dead. Disease severity peaked in early September, after which regrowth started to outpace new disease development. In addition to commercial entries, 30 Plant Introductions (see below) and 133 USDA-ARS breeding lines and checks from two USDA cooperators (Ft. Collins, CO and East Lansing, MI) were evaluated in randomized replicated trials and rated for disease reaction on two dates. Fort Collins' entry ratings (57 entries) ranged from 5.0 to 7.5, excluding the checks EL50/2 (score 4.5) and F1042 (score 7.8) (overall mean 6.4, LSD 0.05 = 0.8) at the last rating. East Lansing tested 77 breeding lines in the Cercospora nursery and in an adjacent agronomic nursery, in various trial configurations (Table 1).

Table 1: East Lansing breeding materials evaluated for Cercospora leaf spot.

Entry	EL Number	N Rows	Mean(Cerc Rating:8/29/18)	Mean(Cerc Rating:9/6/18)	Selected Mother Root Population	Pollinator Population
203	EL-A16-00022	3.0	3.3	4.0	(entryK5)-KEMS8-600	OP.5E
963	EL-A021482	4.0	1.8	4.0	EL50/2 : PI 664912	WC050194
215	EL-A16-01005	4.0	1.8	4.3	RIL ms captures	OP
941	EL-A16-00017	4.0	2.0	4.3	(entryPI26)-China Ch-11	cerc selns OP.5E
200	EL-A015031	3.0	2.3	4.3	SP6822 for seedling vigor studies	
229	EL-A16-00883	3.0	2.0	4.3	RIL ms captures	OP
247	EL-A16-00017	6.0	3.5	4.5	(entryPI26)-China Ch-11	PI518167
250	EL-A16-00016	6.0	3.2	4.5	FCxEL-Cerc	20101008 (FC#)
937	EL-A16-00013	4.0	2.3	4.5	SR Cerc	cerc selns OP.5E
940	EL-A16-00016	4.0	2.5	4.5	(entryFC16)-(Best FC LSR x Best EL LSR) - mm seedballs Increased	cerc selns OP.5E
949	EL-A16-00025	4.0	2.3	4.5	EI50x07.33B	cerc selns OP.5E
134	EL-A16-00023	44.0	3.0	4.6	storage - SR102 parent	OP.5E
202	EL-A16-00009	6.0	3.3	4.7	wild Cerc PI selections 2009-2014	OP.5E
221	EL-A16-00632	3.0	2.3	4.7	RIL ms captures	OP
230	EL-A16-00889	3.0	2.7	4.7	RIL ms captures	OP
246	EL-A16-00014	3.0	3.7	4.7	SR98xSF	EL-A12-00003
204	EL-A16-01074	4.0	3.3	4.8	C869x	OP-5E Cerc selections
216	EL-A16-01044	4.0	1.8	4.8	RIL ms captures	OP
217	EL-A16-01036	4.0	1.5	4.8	RIL ms captures	OP
251	EL-A16-00024	6.0	3.7	4.8	(entryFC16)-(Best FC LSR x Best EL LSR) - mm seedballs Increased	EL-A024957
252	EL-A16-00025	6.0	3.2	4.8	EL Cerc Seln	EL-A021739
133	EL-A18-0101	2.0	4.0	5.0	SR98/2	OP.5E
201	EL-A021503	3.0	3.7	5.0	wild APH Mix: (SP6822-4 X PI540625-4) ms	IC w/ 03B080, 83, 88, 89, 90, 92, 95, 97, 102, 103, 106
207	EL-A16-01073	4.0	3.3	5.0	C869x	OP-5E Cerc selections
210	EL-A16-01066	4.0	3.0	5.0	C869x	OP-5E Cerc selections
211	EL-A16-01089	4.0	3.0	5.0	C869x	OP-5E Cerc selections
219	EL-A16-00462	3.0	3.3	5.0	RIL ms captures	OP
220	EL-A16-00459	3.0	2.3	5.0	RIL ms captures	OP
225	EL-A16-00634	3.0	2.7	5.0	RIL ms captures	OP
227	EL-A16-00890	3.0	2.7	5.0	RIL ms captures	OP
231	EL-A16-00935	3.0	3.0	5.0	RIL ms captures	OP
235	EL-A15-00005	6.0	3.0	5.0	5E storage	14B556
239	EL-A15-01095	3.0	3.7	5.0	elites (EL50;storage;rhizoc;suc;nema) x wilds	Field OP
243	EL-A16-00012	3.0	3.7	5.0	EL50/2 OP5E	EL-A021482
253	EL-A17-00949	2.0	2.5	5.0	EI50x07.33B	
946	EL-A16-00022	4.0	2.8	5.0	(entryK5)-KEMS8-600	cerc selns OP.5E
205	EL-A16-01065	4.0	3.3	5.3	C869x	OP-5E Cerc selections
206	EL-A16-01077	4.0	3.5	5.3	C869x	OP-5E Cerc selections
212	EL-A16-01067	4.0	3.3	5.3	C869x	OP-5E Cerc selections
214	EL-A16-01080	4.0	3.5	5.3	C869x	OP-5E Cerc selections
218	EL-A16-00945	4.0	2.5	5.3	RIL ms captures	OP
936	EL-A16-00012	4.0	3.0	5.3	EL50/2: OP5E	cerc selns OP.5E
951	EL-A1402159	4.0	2.3	5.3	Gp7&8	OP 2014 Bot East
959	EL-A024974	4.0	2.5	5.3	SR w/EL	OP '09 RngA
961	EL-A029770	4.0	3.3	5.3	EL62 : PI 664917	OP w/ 09 31D nema
123	EL-A18-0103	3.0	2.7	5.3	CRB OP combined	
222	EL-A16-00629	3.0	2.3	5.3	RIL ms captures	OP
224	EL-A16-00589	3.0	2.3	5.3	RIL ms captures	OP
226	EL-A16-00627	3.0	2.7	5.3	RIL ms captures	OP
233	EL-A16-01084	3.0	2.7	5.3	C869x	OP-5E Cerc selections
238	EL-A1402160	3.0	4.3	5.3	Cerc PI's (Grp 5)	OP 2014 Bot East
244	EL-A16-00031	3.0	3.7	5.3	EL selection 2015 B&B	OP 2015 Bot East
245	EL-A16-00013	3.0	3.3	5.3	SR Cerc	EL-A027156
208	EL-A16-01081	4.0	3.0	5.5	C869x	OP-5E Cerc selections
209	EL-A16-01072	4.0	3.0	5.5	C869x	OP-5E Cerc selections
237	EL-A1402162	12.0	2.6	5.5	CercGp1.2014BotEast	Cercospora (Grp 1)
948	EL-A16-00024	4.0	2.8	5.5	EL Cerc Seln	cerc selns OP.5E
954	EL-A1402163	4.0	3.0	5.5	Nematode / Storage / Cerc / Rhizoc (Gp9 seq)	OP 2014 Bot East
228	EL-A16-00728	3.0	2.3	5.7	RIL ms captures	OP
232	EL-A16-00891	3.0	3.0	5.7	LSC.5	OP
236	EL-A15-00002	12.0	2.3	5.7	mix:C869xFC607 F2s mostly	OP 2015 5B
241	EL-A16-00032	3.0	3.7	5.7	PI,Kimberly,FC selections	PI,Kimberly,FC selections
932	EL-A021507	4.0	3.0	5.8	Mix: SR96+rhizomania	IC w/ 03B030,31,36,41,46,47,48,50,51,52,56,57,58,62,63 (3waymix)
500	EL-A17-0100	24.0	3.8	5.8	Lee Panella's Cerc Resis Red	
223	EL-A16-00458	3.0	2.7	6.0	RIL ms captures	OP
234	EL-A16-01071	3.0	3.0	6.0	C869x	OP-5E Cerc selections
242	EL-A16-00020	3.0	4.0	6.0	(entryFC20)-20071003H2; LSR {(BGRC 45511) maritima (Greece/annual) x Sucrose} x Z325aa	20111031 (FC#)
249	EL-A16-00018	6.0	4.2	6.0	(entryFC47)-FC1741 Population (rz1rz1Rz2Rz2)	20141009 (FC#)
950	EL-A16-00031	4.0	2.5	6.0	EL selection 2015 B&B	OP 2015 Bot East
962	EL-A027152	4.0	3.0	6.0	SR100 : PI 664923	IC w/ 2010 5B : Good Nema
C59		11.0	3.0	6.1	Commercial Susceptible	
213	EL-A16-01088	4.0	3.8	6.3	C869x	OP-5E Cerc selections
935	EL-A16-00008	4.0	3.3	6.3	CN927-202 5927-202 NN? x 08-5E	hi temp germ OP.5A
958	EL-A022776	4.0	3.0	6.3	EL64, pEL63	IC w/ 08-5E (nema mix)
248	EL-A16-00021	6.0	4.3	6.3	(entryFC12)-FC712/MonoHy A4	20041010HO (FC#)
956	EL-A027146	4.0	3.8	6.5	PI 355963 germ test seln	IC w/ 2010 5E / Nema salt mixer
135	EL-A18-0102	4.0	4.5	6.8	F1042 Cerc Susceptible	OP.5E
934	EL-A16-00007	4.0	4.3	6.8	PI 357361 germ test seln	hi temp germ OP.5A
mean			3.0	5.2		
F value			6.89***	6.68***		
LSD 0.05			0.8	0.8		
CV			25.4	15.2		

Alternaria is frequently being seen in the Great Lakes growing region. A subset of Table 1 entries was inoculated with Alternaria alone (June 11), in a separate trial adjacent to the Cercospora nursery. Alternaria was also rated in a non-inoculated trial (NIC). Alternaria inoculation and rating preceded inoculation by Cercospora, and one trial inculed inoculation with both leaf spot pathogens (Alternaria and Cercospora). All trials were randomized 4-rep, 1-row. Alternaria scores were higher in the inoculated trial, with significant differences seen, relative to the non-inoculated trial, where no significant differences were detected (Table 2A).

Cercospora was rated in all trials irrespective of whether they were inoculated or not. Disease ratings of inoculated trials, irrespective of pathogen, were larger than the non-inoculated trial (Table 2A). In most cases, Cercospora scores of germplasm inoculated with either pathogen were similar, however in two cases (Entries 948 and 954) the dual inoculation may have resulted in increased Cercospora damage. In general, it appears that leaf spot resistance may be effective in this set of germplasm irrespective of leaf spot pathogen tested.

Table 2A: Alternaria and Cercospora scores from 20 germplasms included in Table 1 but tested in three inoculated disease environments. Green shading indicates Entries with scores not significantly different than the 'best' for each trial (e.g. least disease).

		Alternaria inoculated	**Yes**	No	**Yes**	**Yes**	No
		Cercospora inoculated	No	No	**Yes**	No	No
Entry	Inventory Number	type	Alternaria (7/24)	Alternaria (7/24) (NIC)	Cerc 9/6 (Cerc-Alt)	Cerc 9/6 (Alt)	Cerc 9/6 (NIC)
963	EL-A021482	EL50/2 : PI 664912	1.5	0.8	4.0	4.0	3.0
937	EL-A16-00013	SR Cerc	1.0	2.0	4.5	5.0	3.0
940	EL-A16-00016	(entryFC16)-(Best FC LSR x Best EL LSR) - mm seedballs Increased	1.5	2.0	4.5	4.8	3.0
954	EL-A1402163	Nematode / Storage / Cerc / Rhizoc (Gp9 seq)	2.0	2.5	5.5	4.8	3.3
948	EL-A16-00024	EL Cerc Seln	2.8	2.0	5.5	4.8	3.3
949	EL-A16-00025	EL50x07.33B	1.3	2.0	4.5	4.5	3.3
941	EL-A16-00017	(entryPI26)-China Ch-11	1.5	1.5	4.3	4.0	3.5
959	EL-A024974	SR w/EL	2.5	1.5	5.3	5.0	3.5
946	EL-A16-00022	(entryK5)-KEMS8-600	1.3	1.0	5.0	5.0	3.5
951	EL-A1402159	Gp7&8	2.8	1.5	5.3	5.3	3.8
932	EL-A021507	Mix: SR96+rhizomania	3.0	2.8	5.8	6.3	3.8
961	EL-A029770	EL62 : PI 664917	2.8	1.3	5.3	6.0	3.8
962	EL-A027152	SR100 : PI 664923	2.5	2.8	6.0	5.5	4.0
950	EL-A16-00031	EL selection 2015 B&B	2.8	2.0	6.0	5.3	4.0
958	EL-A022776	EL64, pEL63	3.3	1.8	6.3	6.3	4.0
935	EL-A16-00008	CN927-202 5927-202 NN? x 08-5E	2.8	2.0	6.3	6.3	4.0
956	EL-A027146	PI 355963 germ test seln	4.3	2.3	6.5	6.5	4.0
936	EL-A16-00012	EL50/2: OP5E	3.3	2.0	5.3	6.0	4.0
934	EL-A16-00007	PI 357361 germ test seln	4.3	3.0	6.8	6.8	4.3
135	EL-A18-0102	F1042 Cerc Susceptible	1.3	1.5	6.8	7.8	5.3
		Mean	2.40	1.90	5.45	5.48	3.70
		F-ratio	2.44**	0.97 ns	8.47***	12.20***	6.26***
		LSD (0.05)	1.75	1.73	0.81	0.79	0.61
		CV	59.89	63.56	17.49	19.49	17.41

Average plot weight (in lbs) was determined for the inoculated and uninoculated trials. Sugars were determined via near-infrared spectroscopy (NIR) with the assistance of Michigan Sugar Co (Table 2B). Root yield means were variable, but likely more affected by Cercospora than Alternaria. Sucrose also appeared less affected by Alternaria inoculation relative to Cercospora inoculation.

Table 2B: Yield data from 20 germplasms in three inoculated disease environments. Green shading indicates Entries with scores not significantly different than the 'best' for each trial (e.g. best agronomics).

Entry	Weight (NIC)	Weight (Alt)	Weight (Cerc-Alt)	Sucrose (NIC)	Sucrose (Alt)	Sucrose (Cerc-Alt)	Sugar/plot (NIC)	Sugar/plot (Alt)	Sugar/plot (Cerc-Alt)
963	13.5	18.5	9.5	15.7	16.2	16.0	2.1	3.1	2.0
937	19.5	23.0	11.0	15.5	16.0	14.9	3.1	3.7	1.6
940	13.5	19.5	12.0	15.8	15.7	13.8	2.1	3.1	1.6
954	19.5	22.0	16.5	15.7	15.5	14.7	3.1	3.4	2.5
948	23.0	20.0	14.5	15.5	14.3	14.1	3.6	2.9	2.1
949	13.5	19.5	13.0	15.7	14.8	13.6	2.9	2.9	1.8
941	13.5	18.5	18.0	16.7	17.6	15.3	2.3	3.3	2.8
959	22.5	24.5	13.5	15.2	15.2	13.9	3.4	3.7	1.9
946	12.0	11.5	8.5	16.6	16.3	14.8	2.0	1.9	1.2
951	20.0	21.5	20.0	15.8	14.8	13.6	3.1	3.2	2.7
932	20.5	19.0	14.5	16.1	14.8	14.6	3.3	2.8	2.1
961	12.5	17.0	13.5	16.6	14.2	13.7	2.1	2.4	1.8
962	20.0	19.0	20.0	15.7	15.0	13.3	3.1	2.8	2.7
950	17.0	19.0	18.0	14.6	14.1	11.7	2.5	2.7	2.1
958	16.0	17.5	11.0	14.3	14.2	13.6	2.3	2.5	2.0
935	23.0	19.5	15.5	15.8	13.8	12.5	3.7	2.3	2.0
956	15.5	20.0	19.5	13.4	11.3	10.0	2.6	2.3	1.9
936	11.0	11.0	9.0	15.3	14.0	13.3	1.7	1.6	1.2
934	19.5	23.0	15.5	13.1	11.0	8.9	2.5	2.5	1.4
135	7.5	7.0	3.0	14.7	13.7	13.0	1.1	1.0	0.4
Mean	16.65	18.53	13.80	15.41	14.63	13.44	2.63	2.70	1.92
F-ratio	1.81*	3.07***	2.21**	4.90***	9.21***	6.89***	1.88*	2.92***	1.88*
LSD (0.05)	9.29	7.00	8.33	1.19	1.42	2.07	1.40	1.13	1.06
CV	43.15	32.22	48.51	7.66	11.92	14.87	41.48	35.84	43.22

Thirty Plant Introductions (PIs) from the USDA-ARS National Plant Germplasm System (NPGS) *Beta* Collection [includes garden beet, sugarbeet, leaf beet, fodder beet (*Beta vulgaris* L.), and wild beet (*Beta* spp.)] were evaluated for resistance to *Cercospora beticola* in an artificially produced epiphytotic environment (based generally on Ruppel, E.G. and J.O. Gaskill. 1971. J. Am. Soc. Sugar Beet Technol. 16:384). A randomized complete-block design with 1-row and 3-replications was used to evaluate germplasm at the Michigan State University Saginaw Valley Research and Extension Center (SVREC) near Frankenmuth, MI. Internal controls included a susceptible check, F1042 (PI 674103), and a resistant check, EL50/2 (PI 664912). The nursery was spray-inoculated with a liquid spore suspension (approximately 1 x 10^3 spores/ml as determined with a hemacytometer) of *C. beticola*. Inoculum was produced from a mixture of leaves collected from the 2017 inoculated leaf spot nursery at SVREC and naturally infected beets grown at SVREC and on the Michigan State University campus farms in East Lansing, MI. Visual evaluations of the plot with a disease index (DI) on a scale from 0-10 where 0=no symptoms, 1=a few scattered spots, 2=spots coalescing or in large numbers on lower leaves only, 3= some dieback on lower leaves, but leaves not entirely dead, 4-8 are increasing amounts of dead and diseased tissue, 9= mostly dead with few remaining living leaves with large dead patches, and 10=all leaves dead. Bolting beets were removed throughout the season. No new resistance sources were apparent (Table 3).

Table 3: Plant Introductions tested for Cercospora leaf spot reaction, sorted by ratings of 9/6).

Entry	Accession	Origin	Name	Type	15-Aug	22-Aug	29-Aug	6-Sep	13-Sep
139	Resistant check	United States, Michigan	EL50/2	SUGAR	1.0	1.7	2.0	3.0	3.7
p20	PI 590837	United States, Colorado	FC 607	SUGAR	1.3	2.0	2.7	4.0	4.3
p12	PI 518166	China	Ch-4	SUGAR	1.7	2.7	3.3	4.3	5.0
p04	NSL 28024	United States, Wyoming	EXTRA EARLY	TABLE	3.0	4.0	4.3	4.7	5.3
p07	NSL 188575	China	NS-358 (C1)	SUGAR	1.3	3.3	3.7	4.7	5.7
p13	PI 590696	United States, North Dakota	F1002	SUGAR	2.3	4.0	4.0	4.7	5.3
p15	PI 590703	United States, Colorado	FC 702/6	SUGAR	1.7	3.3	4.0	4.7	5.0
p21	PI 612770	United States, California	EL40 BREEDING LINE 32 and 29	SUGAR	1.7	2.7	3.3	4.7	5.7
p28	PI 633936	United States, Utah	AT3993-7	UNKNOWN	2.0	3.0	4.0	4.7	5.3
p01	Ames 8284	United Kingdom, England	IDBBNR 9501	UNKNOWN	3.0	4.0	5.0	5.0	5.0
p02	Ames 8291	United Kingdom, England	IDBBNR 9508	UNKNOWN	2.7	4.0	3.7	5.0	5.7
p06	NSL 43404	United States, Idaho	PARMA GLOBE	TABLE	3.0	4.0	5.0	5.0	6.0
p08	PI 355957	Asia Minor	AF'JUN-KARAGISSARSKAJA	SUGAR	1.7	3.0	3.7	5.0	5.3
p14	PI 590697	United States, Maryland	SP70756-0	SUGAR	2.0	3.0	3.7	5.0	5.0
p17	PI 590713	United States, California	063T	SUGAR	2.0	3.7	4.0	5.0	6.3
p18	PI 590755	United States, Colorado	FC 702/7	SUGAR	2.0	3.0	3.7	5.0	5.0
p09	PI 357353	Macedonia	GOSTIVARSKO	FODDER;LEAF	3.0	4.0	4.7	5.3	5.7
p24	PI 613201	United States, Colorado	GW 064-LOT 8303R	SUGAR	2.7	4.0	4.0	5.3	6.0
p29	PI 633939	United States, Utah	AT3994-7	UNKNOWN	3.0	3.5	4.5	5.5	6.5
p03	Ames 14432	Bulgaria, Plovdiv	Bordo-60	TABLE	3.0	4.0	4.7	5.7	6.7
p10	PI 379099	Macedonia	CRVENO OKRUGLO	SUGAR	3.0	4.0	5.0	5.7	7.0
p16	PI 590712	United States, California	086T	SUGAR	3.0	4.3	4.7	5.7	6.3
p19	PI 590765	United States, North Dakota	F1006	SUGAR	2.3	3.3	4.0	5.7	6.0
p25	PI 613202	United States, Colorado	GW 065-46C	SUGAR	2.3	3.7	4.7	5.7	6.0
p30	PI 633940	United States, Utah	AT3994-8	UNKNOWN	2.0	3.7	4.3	5.7	6.7
p11	PI 510669	United States, North Dakota	F1008	SUGAR	2.7	4.3	4.7	6.0	6.7
p23	PI 613199	United States, Colorado	GW 049-41R	SUGAR	3.0	4.7	5.3	6.0	6.7
p26	PI 613204	United States, Colorado	GW 087-45R	SUGAR	2.0	3.7	4.7	6.0	6.7
135	Susceptible check	United States, North Dakota	F1042	SUGAR	3.3	5.0	5.3	6.3	7.0
p05	NSL 28026	United States, Wyoming	GARDENERS MODEL	TABLE	3.0	4.0	5.3	6.3	6.7
p22	PI 613197	United States, Colorado	GW 18-43	SUGAR	3.7	4.7	5.3	6.3	6.7
p27	PI 614829	United States, Utah	552	UNKNOWN	2.3	4.3	5.7	7.0	7.7
			Grand mean		2.39	3.64	4.26	5.27	5.90
			F ratio		4.12***	5.64***	5.36***	5.27***	5.90***
			LSD 0.05		0.91	0.80	0.99	0.95	1.02
			CV		33.6	23.7	22.4	17.5	17.0

Rhizoctonia nurseries:

The BSDF cooperative CRR Eastern Evaluation Nursery had entries from four companies, with a total of 312 entries (24 entries were conventional varieties) plus two control varieties evaluated. This nursery was 1-row with 5 replications conducted in a double-blind fashion. In addition, susceptible or moderately resistant varieties were planted to collect sacrificial samples through the season and assess root rot development. The nursery was inoculated on July 11 with a dry ground barley inoculum of *Rhizoctonia solani* Anastomosis Group 2-2 (highly virulent isolate) at 1.1 g per foot of row using a Gandy applicator to apply inoculum directly to the rows. The nursery was sprayed with water following inoculum application to ensure sufficient moisture for infection. Roots in the Roundup Ready nursery were dug (a little later than desired due to weather) with a single row harvester on August 15 and 16, and the conventional nursery on August 24. Each root was rated for disease severity using a 0-7 scale where 0=no visible lesions and 7=root completely rotted. A weighted disease index was calculated for each replicate. Variety disease index means for the 2018 nursery ranged from 3.2 to 6.7 (average ≈ 4.6).

A seedling Rhizoctonia selection nursery was also conducted at the SVREC in 2018, and included 66 entries derived from the resistant germplasm release SR98/2. The singular difference between conventional CRR and seedling trials was that the seedling nursery was inoculated on May 29 rather than June 29. Stand was greatly affected in these entries by the end of the season, and mother roots of only 8 entries were selected for freedom from disease and root conformation for seed production in the 2019 greenhouse.

We extend our gratitude to Paul Horny and Dennis Fleischmann for their help with nursery and farm operations.

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Evaluation of foliar fungicide treatments to manage Cercospora leaf spot of sugar beet

Jaime Willbur and Chris Bloomingdale, Michigan State University

Location: Frankenmuth (SVREC)	**Treatment Timings:** 14 day interval at 45 DSV
Planting Dates: April 30, 2018	**Pesticides:** see table
Soil Type: Loam	**O.M.:** 5.0 **pH:** 7.5
Replicates: 4	**Variety:** C-G351NT

Summary: Mean CLS ratings were significantly different among treatments (P<0.0001). Programs 1-7 provided the greatest level of plant protection, with a mean disease severity ranging from 4.3-5.0, which is below the economic threshold of 6. Disease levels in programs 17-19 were not significantly different from the non-treated control, and had disease severity range of 7.5-8.0. Significant differences among program yields were detected (P=0.01). Though numerically many programs had mean yields greater than the control plot (18.7 t/A), programs 3, 5, and 8 were the only programs with mean yields significantly greater than the control. Significant differences were found among treatments for percent sugar (P<0.0001) and RWST values (P<0.001). The greatest percent sugar values resulted from programs 1, 3, 4, and 6, with a range of 13.9-14.6%. RWST values were greatest in programs 1-8, and had mean values of 191.9-205.3 lb sugar/ton of beet. The lowest percent sugar and RWST means resulted from programs 15-20. It is noted that lower than normal yields, percent sugar, and RWST values are most likely due to the early harvest and stand establishment issues. Overall, the top three performing programs were numbers 2, 3, and 8.

Table 1. End of season disease severity and yield parameters from the tested fungicide programs.

No.	Treatment, Rate/A, and Timing[a]	Disease Severity[b,c]	Yield (t/A)	Sugar (%)	RWST
1	Minerva Duo (16 fl oz) ACDF + Super Tin (8 fl oz) BE + Koverall (1.5 lbs) BE	4.3 e	21.7 a-e	14.1 a-c	199.0 ab
2	Manzate Max (1.6 qt) ABCDEF + Inspire XT (7 fl oz) AC + Super Tin (8 fl oz) BD	4.5 de	22.0 a-e	13.8 b-d	192.3 a-d
3	Manzate Max (1.6 qt) ABCDEF + Acropolis (32 fl oz) AC + Super Tin (8 fl oz) BD	4.5 de	23.3 b	14.6 a	205.3 a
4	Inspire XT (7 fl oz) A + Manzate Max (1.6 qt) ABCDF + Super Tin (8 fl oz) C + Cuprofix Ultra (3 lb) E	4.7 de	22.5 a-d	13.9 a-d	193.6 a-c
5	Manzate Max (1.6 qt) ABCDEF + Inspire XT (7 fl oz) AC + MasterCop (1.5 pt) BCD + Super Tin (8 fl oz) BD	4.8 de	23.2 ab	13.6 b-f	191.9 a-e
6	Manzate Max (1.6 qt) ABCDEF + Inspire XT (7 fl oz) AC + AgriLife (1 qt) BCD + Super Tin (8 fl oz) BD	4.8 de	19.4 d-g	14.5 a-b	204.6 a
7	Manzate Max (1.6 qt) ABCDEF + Inspire XT (7 fl oz) AC + Badge SC (2 pt) BCD + Super Tin (8 fl oz) BD	5.0 de	22.4 a-e	13.8 b-e	192.2 a-d
8	Super Tin (8 fl oz) A + Manzate Max (1.6 qt) ACF + Dexter Max (2.1 lb) BD + Inspire XT (7 fl oz) C + Cuprofix Ultra (3 lb) E	5.3 d	23.25 b	13.8 b-e	192.6 a-d
9	Super Tin (8 fl oz) A + Manzate Max (1.6 qt) ABCDF + Inspire XT (7 fl oz) C + Cuprofix Ultra (3 lb) E	5.3 d	20.3 b-g	13.3 d-f	183.5 c-e
10	Inspire XT (7 fl oz) A + Manzate Max (1.6 qt) ACF + Dexter Max (2.1 lb) BD + Super Tin (8 fl oz) C + Cuprofix Ultra (3 lb) E	5.3 d	20.7 b-g	13.3 d-f	183.2 c-e
11	Brixen (21 fl oz) AD + Super Tin (8 fl oz) BE + Koverall (1.5 lb) BE + Minerva Duo (16 fl oz) CF	5.3 d	19.6 a-g	13.5 c-f	188.1 b-e
12	Minerva (13 fl oz) AD + Super Tin (8 fl oz) BE + Koverall (1.5 lb) BE + Minerva Duo (16 fl oz) CF	5.3 d	21.3 b-f	13.6 c-e	189.4 b-e
13	Manzate Max (1.6 qt) ABDF + Inspire XT (7 fl oz) AB + LifeGard (4.5 oz/100gal) CE + Super Tin (8 fl oz) D	6.3 c	21.9 a-e	13.1 e-g	180.8 d-f
14	Manzate Max (1.6 qt) A + Badge SC (2 pt) BCDEF	6.5 c	22.7 a-d	13.6 c-e	189.3 b-e
15	Manzate Max (1.6 qt) A + MasterCop (1.5 pt) BCDEF	7.0 bc	19.1 e-g	12.5 gh	169.1 fg
16	Manzate Max (1.6 qt) A + AgriLife (1 qt) BCDEF	7.0 bc	18.3 fg	12.2 h	165.0 g
17	Double Nickel (1 qt) ABCDEF + Kocide 3000-O (1.5 lb) ABCDEF	7.5 ab	20.2 b-g	12.9 f-h	177.1 e-g
18	Experimental (1% v/v) ABCDEF	7.8 ab	19.5 d-g	12.2 h	166.7 g
19	LifeGard (4.5 oz/100 gal) ABCDEF	7.8 ab	17.6 g	12.4 gh	169.7 fg
20	Non-Treated Control	8.0 a	18.7 c-g	12.3 h	166.3 g

[a] Application letters code for the following dates: A=20 Jun, B=3 Jul, C=17 Jul, D=31 Jul, E=14 Aug, F=30 Aug.

[b] Disease severity based on a 0-10 scale with the following breakdown of 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%.

[c] Column values followed by the same letter are not significantly different based on Fisher's Protected LSD (α=0.05); if no letter, then the effect is not significant.

Evaluation of in-furrow and banded fungicides treatments to manage Rhizoctonia root and crown rot of sugar beet

Jaime Willbur and Chris Bloomingdale, Michigan State University

Location: Frankenmuth (SVREC)	**Treatment Timings:** In-Furrow & Banded at 6-8 leaves
Planting Dates: April 26, 2018	**Pesticides:** see table
Soil Type: Loam	**O.M.:** 5.0 **pH:** 7.5
Replicates: 4	**Variety:** C-G351NT

Table 1. Disease index (root rating at harvest), seasonal plant loss, and yield parameters of fungicide programs.

No.	Treatment, Rate/A	Application Type	Disease Index (%)[a,b]	Total Plant Loss (%)	Yield (t/A)	Sugar (%)	RWST
1	Serenade ASO 2 qt Quadris 13.9 fl oz Proline 480SC 5.7 oz	In-Furrow, In-Furrow, Banded	16.1 c	17.3 d	13.9 a	12.7	171.3
2	Experimental 12.8 fl oz Quadris 13.9 fl oz Proline 480SC 5.7 fl oz	In-Furrow, In-Furrow, Banded	29.8 bc	23.0 cd	10.5 ab	12.8	173.9
3	Proline 480SC 5.7 fl oz Quadris 13.9 fl oz	In-Furrow, In-Furrow	31.2 bc	29.5 b-d	8.5 b	13.1	179.3
4	Serenade ASO 2 qt Propulse 10 fl oz Quadris 13.9 fl oz	In-Furrow, In-Furrow, Banded	39.0 b	30.3 bc	8.9 b	12.7	172.0
5	Serenade ASO 2 qt Proline 480SC 5.7 fl oz Quadris 13.9 fl oz	In-Furrow, In-Furrow, Banded	41.4 b	35.5 bc	9.6 ab	12.6	169.4
6	Quadris 13.9 fl oz	In-Furrow	45.5 b	27.3 cd	7.2 bc	12.5	168.8
7	Propulse 10 fl oz	In-Furrow	45.9 b	41.3 b	5.7 bc	12.9	176.4
8	Non-Treated Control	N/A	77.7 a	71.8 a	1.7 c	12.6	170.9

[a] Column values followed by the same letter are not significantly different based on Fisher's Protected LSD (α=0.05); if no letter, then the effect is not significant.

[b] Disease index was calculated by multiplying the disease incidence (0-100%) by the mean symptomatic root severity (1-7) and dividing by 7.

Summary: Mean disease index values were significantly different among treatments (P<0.01), with all treatments exhibiting significantly lower levels of root infection than the non-treated control plot. The lowest disease ratings were observed in treatments 1, 2, and 3, with an index ranging between 16.1% and 31.2%. The percent of plants lost during the season was significantly different among treatments (P<0.0001); the non-treated control had significantly greater losses than other plots, with a mean loss of 71.8%. Treatments with the lowest levels of loss included 1, 2, 3, and 6, with values between 16.1% and 29.5%. Despite having overall low yield values, there were significant differences among treatments (P<0.05). Treatment 1 provided the greatest mean yield, 13.9 t/A; treatments 2 and 5 performed similarly. The lowest mean yield was obtained in non-treated plots, which did not differ from treatments 6 or 7. The range of mean yields for these treatments was 1.7-7.2 t/A. There were no differences in percent sugar or RWST values among the tested treatments (P>0.05). To prevent residual foliar fungicide effect on Rhizoctonia infection, no foliar leaf spot management was conducted; this, combined with the severe Rhizoctonia root rot, may account for the low yield parameters observed in this trial. Taking this into consideration, program 1 performed overall better than the other programs in this study.

Sugarbeet (Beta vulgaris) 'Crystal G351NT'
Rhizoctonia Crown and Root Rot; *Rhizoctonia solani*

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Control of Rhizoctonia crown and root rot with fungicides in sugarbeet-Richville 2018

Sugar beet cv. Crystal G351NT was PAT-treated and planted at the Michigan State University Bean and Beet Farm, Richville, MI on 2 May. Seed was planted at 1" depth into four-row by 15-ft plots (ca. 2.5 in. between plants to give a target population of 480 plants/100 ft. row) with 20" between rows replicated four times in a randomized complete block design. Fertilizer was drilled into plots immediately before planting, formulated according to results of soil tests (125 lb 46-0-0/A). No additional nitrogen was applied. All fungicides were applied with a hand-held R&D spray boom delivering 10 gal/A (50 p.s.i.) and using one XR8002VR nozzle per row in a 6" band at planting (A) or on 20 Jun at GS 6-8 (B). Weeds were controlled by cultivation and with Roundup Original Max 2.0 pt/A applied at GS 6-8. Insects were controlled as necessary. Plant stand was rated 14, 21 and 28 days after planting (DAP) and relative rate of emergence was calculated as the Relative Area Under the Emergence Progress Curve [RAUEPC from 0 – 27 DAP, maximum value = 100]. Plots were inoculated on 29 May [27 days after planting (DAP)] by spreading *R. solani* Anastomosis Group 2.2 (IIIB) infested millet across all plants in each plot (Figures 1-12). Plots were hand hoed at 8 days after inoculation (DAI) to achieve ca. 6 in between plants to give a target population of 200 plants/100 ft. and the relative rate of disease progression was calculated as the Relative Area Under the Disease Progress Curve [RAUDPC from 0 – 37 DAI, maximum value = 100]. Beetroots were machine-harvested on 17 Sep and individual treatments were weighed. Two rows of beets per plot were harvested 138 DAP (15 ft from start of each plot from two center rows) and assessed for crown and root rot (*R. solani*) incidence (%) and severity. Sugar content was measured at the Michigan Sugar Company analytical service laboratory. Severity of crown and root rot was measured as an index calculated by counting the number of roots falling in class 0 = 0%; 1 = <5% (inactive lesions); 2 = <5% (active lesions, no cracking); 3 = 6 – 25% (surface area of root affected by lesions); 4 =26 - 50% (surface area of root affected by lesions); 5 = 51 – 75% (surface area of root affected by lesions); 6 = >75% (surface area of root affected by lesions); and 7 = dead and/or extensively decayed root. The number in each class is multiplied by the class number and summed. The sum is multiplied by a constant to express as a percentage. Increasing index values indicated the degree of severity. The number of beets falling into classes 0 – 3 was summed and a percentage calculated as marketable beets.

Meteorological Data

Meteorological variables were measured with a Campbell weather station located at the farm, latitude 43.3995 and longitude -83.6980 deg. Average daily air temperature (ºF) was 63.7 67.4, 71.8, 71.3 and 64.3 (May, Jun, Jul, Aug and Sep respectively) and the number of days with maximum temperature >90ºF over the same period was 2, 2, 4 and 1 for May, Jun, Jul and Aug respectively except Sep with 0 days. Average daily relative humidity (%) over the same period was 50.7, 55.1, 55.2, 63.0 and 60.5. Average daily soil temperature at 4" depth (ºF) over the same period was 56.0, 63.6, 74.9, 75.8 and 69.1. Average daily soil moisture at 4" depth (% of field capacity) over the same period was 35.9, 35.9, 32.3, 39.7 and 40.0. Precipitation (in.) over the same period was 2.1, 1.5, 2.0, 7.9 and 1.92.

Results

Soil temperature and moisture conditions did not enhance development of crown and root rot throughout the season until Aug and Sep and was reflected in the RAUDPC. No treatments were significantly different in final plant stand in comparison to the non-treated and non-inoculated check. No treatments were significantly different from either check in terms of RAUEPC or RAUDPC compared to the non-treated check. There was no significant difference among treatments in crown and root rot severity at 138 DAP compared to the non-treated and non-inoculated check. All treatments and non-inoculated check with yields greater than 14.4 t/A were significantly higher compared to the non-treated check (5.7 t/A). Treatments with Elatus applied at GS 6-8 had significantly higher yield than Xanthion applied at planting. Plots with Elatus applied at planting had significantly lower sugar content (%) compared to Elatus applied at GS 6-8. All treatments with greater than 21.0% marketable beets were significantly higher than the non-treated check (5.7%). No phytotoxicity was observed from any treatments.

Table 1. Efficacy of fungicides against Rhizoctonia crown and root rot.

Treatment and rate/1000 ft. row (A)= at planting; (B)= at GS 2-8[a]	Plant stand[b] 29 DAP[c] (%)	RAUEPC[d] 0 – 29 DAP	RAUDPC[e] 0 – 37 DAI[f]	Crown and root rot severity[g] 138 DAP (%)[j]	Yield (t)[j]	Sugar content (%)[j]	RWST (lb)[h, j]	Marketable beets (%)[i, j]
Non-treated	55.1	0.023	0.977	34.9	5.7 c	13.1 ab	178.7	5.7 c
Non-inoculated	58.1	0.021	0.979	40.2	15.9 a	13.7 ab	188.2	43.2 a
Quadris 2.08SC 5.9 fl oz/A (A); Elatus 45WG 1.7 fl oz/A (B)	64.3	0.023	0.977	43.2	23.3 a	13.5 ab	185.2	47.0 a
Elatus 45WG 1.7 fl oz/A (A)	66.2	0.026	0.974	37.6	14.4 bc	13.0 b	176.2	32.2 ab
Xanthion A/B 7.2 oz/A (A)	59.0	0.023	0.976	39.5	10.9 cd	13.5 ab	185.3	21.0 bc
Elatus 45WG 1.7 fl oz/A (B)	57.0	0.028	0.972	38.5	17.4 ab	13.9 a	193.2	43.4 a

[a] Application dates; A= 2 May; B= 20 Jun.
[b] Plant stand expressed as a percentage of the target population of 480 plants/100ft. row from a sample of 2 x 15 ft rows per plot.
[c] DAP = days after planting on 2 May.
[d] Relative area under the emergence progress curve from planting to 29 days after planting.
[e] Relative area under the disease progress curve from inoculation to 37 days after inoculation.
[f] DAI = days after inoculation on 29 May.
[g] Severity of crown and root rot was measured as an index calculated as described in the text.
[h] RWST = Recoverable White Sucrose per Ton
[i] The number of beets falling into classes 0 – 3 was summed and a percentage calculated as marketable beets.
[j] Means followed by same letter are not significantly different at $p = 0.05$ (Fishers LSD).

Figure 1. Sugarbeet Rhizoctonia management experimental research plots left as non-treated control (5 Jul).

Figure 2. Sugarbeet Rhizoctonia management experimental research plots left as non-inoculated control (5 Jul).

Figure 3. Sugarbeet Rhizoctonia management experimental research plots treated with Quadris at a rate of 5.9 fl oz/A in furrow at planting and Elatus at a rate of 1.7 fl oz/A banded application at 6-8 leaf growth stage (5 Jul).

Figure 4. Sugarbeet Rhizoctonia management experimental research plots treated with Elatus at a rate of 1.7 fl oz/A in furrow at planting (5 Jul).

Figure 5. Sugarbeet Rhizoctonia management experimental research plots treated with Xanthion at a rate of 7.2 fl oz/A in furrow at planting (5 Jul).


Figure 6. Sugarbeet Rhizoctonia management experimental research plots treated with Elatus at a rate of 1.7 fl oz/A banded application at 6-8 leaf growth stage (5 Jul).

Figure 7. Sugarbeet Rhizoctonia management experimental research plots left as non-treated control (17 Sep).

Figure 8. Sugarbeet Rhizoctonia management experimental research plots left as non-inoculated control (17 Sep).

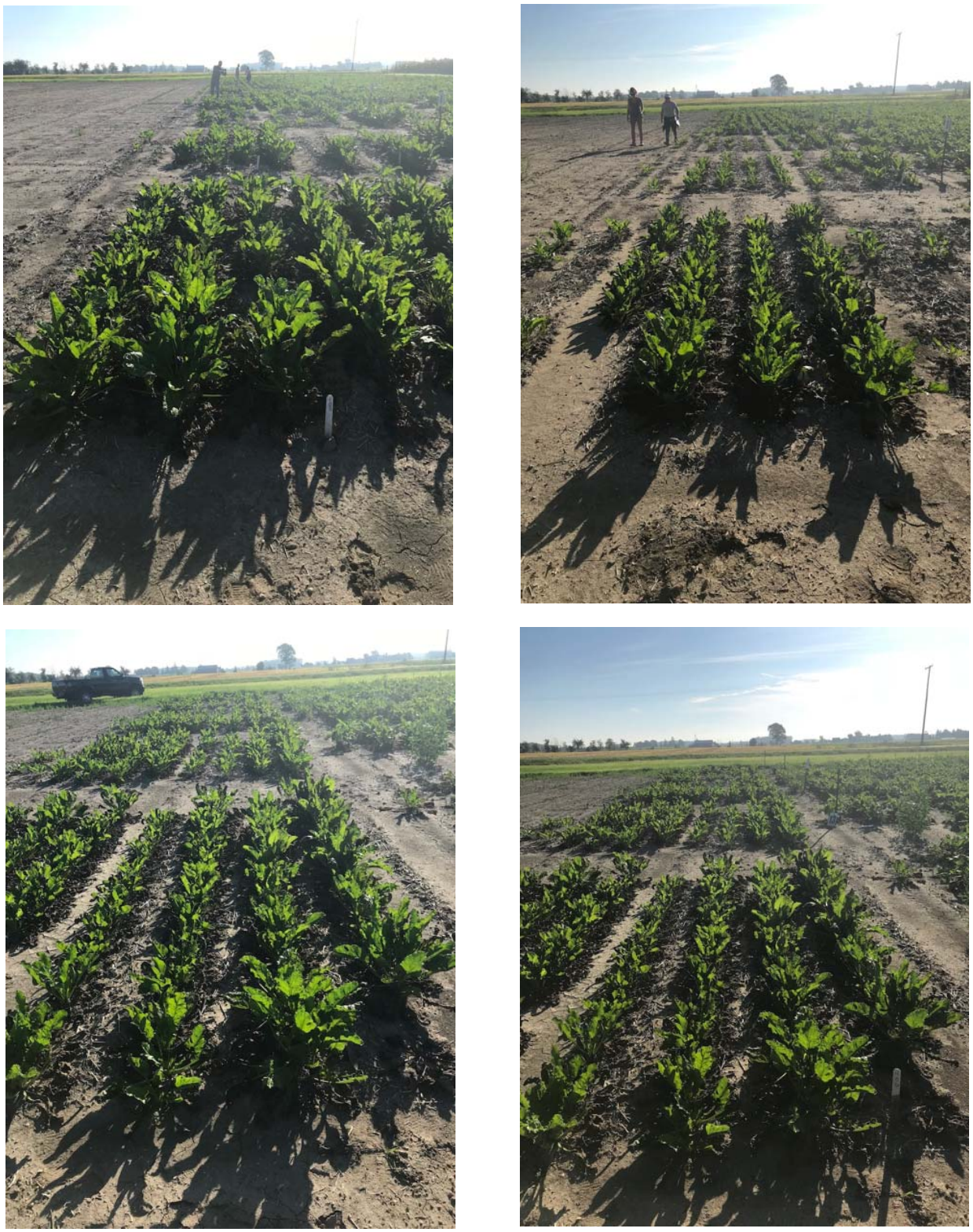

Figure 9. Sugarbeet Rhizoctonia management experimental research plots treated with Quadris at a rate of 5.9 fl oz/A in furrow at planting and Elatus at a rate of 1.7 fl oz/A banded application at 6-8 leaf growth stage (17 Sep).

Figure 10. Sugarbeet Rhizoctonia management experimental research plots treated with Elatus at a rate of 1.7 fl oz/A in furrow at planting (17 Sep).

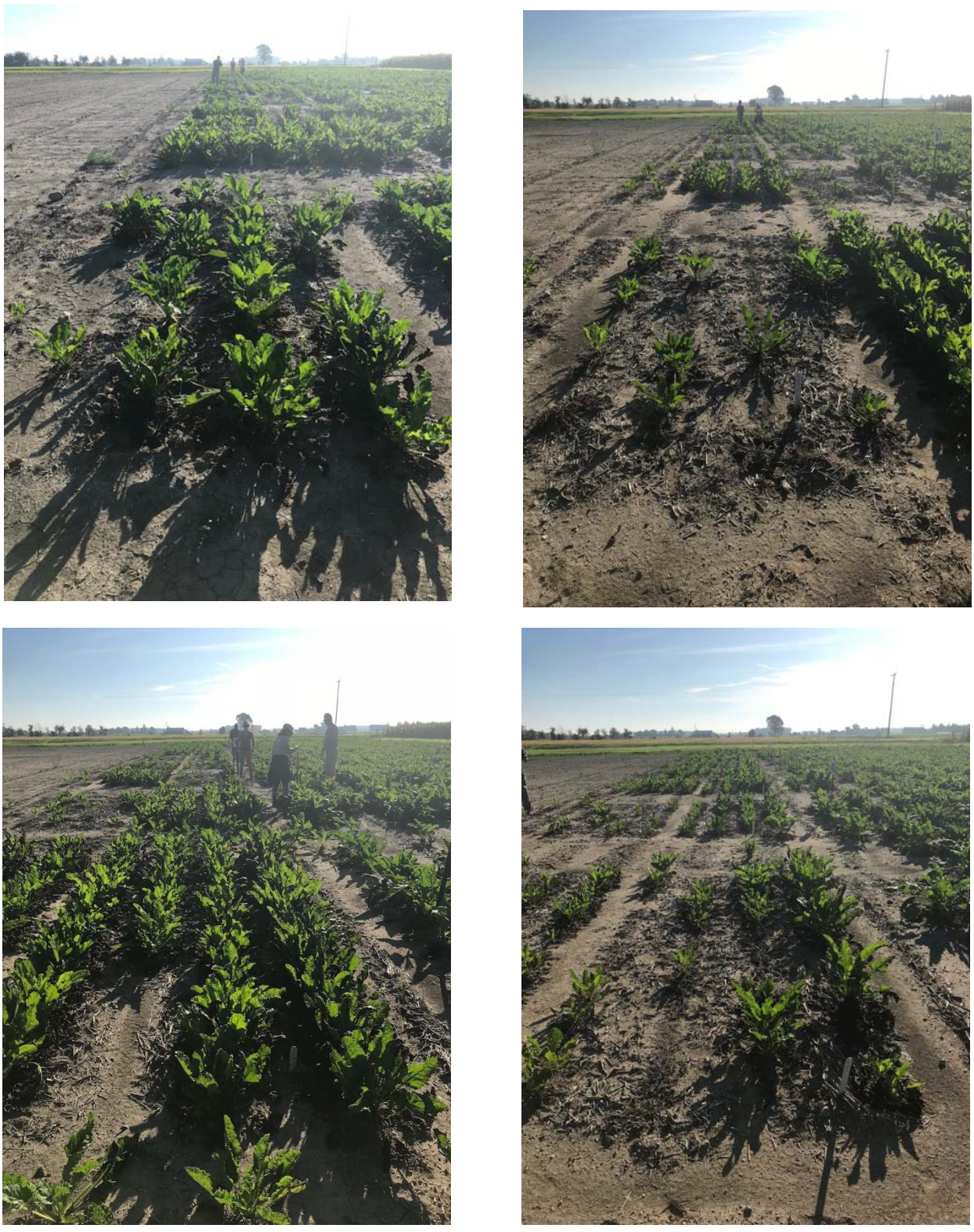

Figure 11. Sugarbeet Rhizoctonia management experimental research plots treated with Xanthion at a rate of 7.2 fl oz/A in furrow at planting (17 Sep).

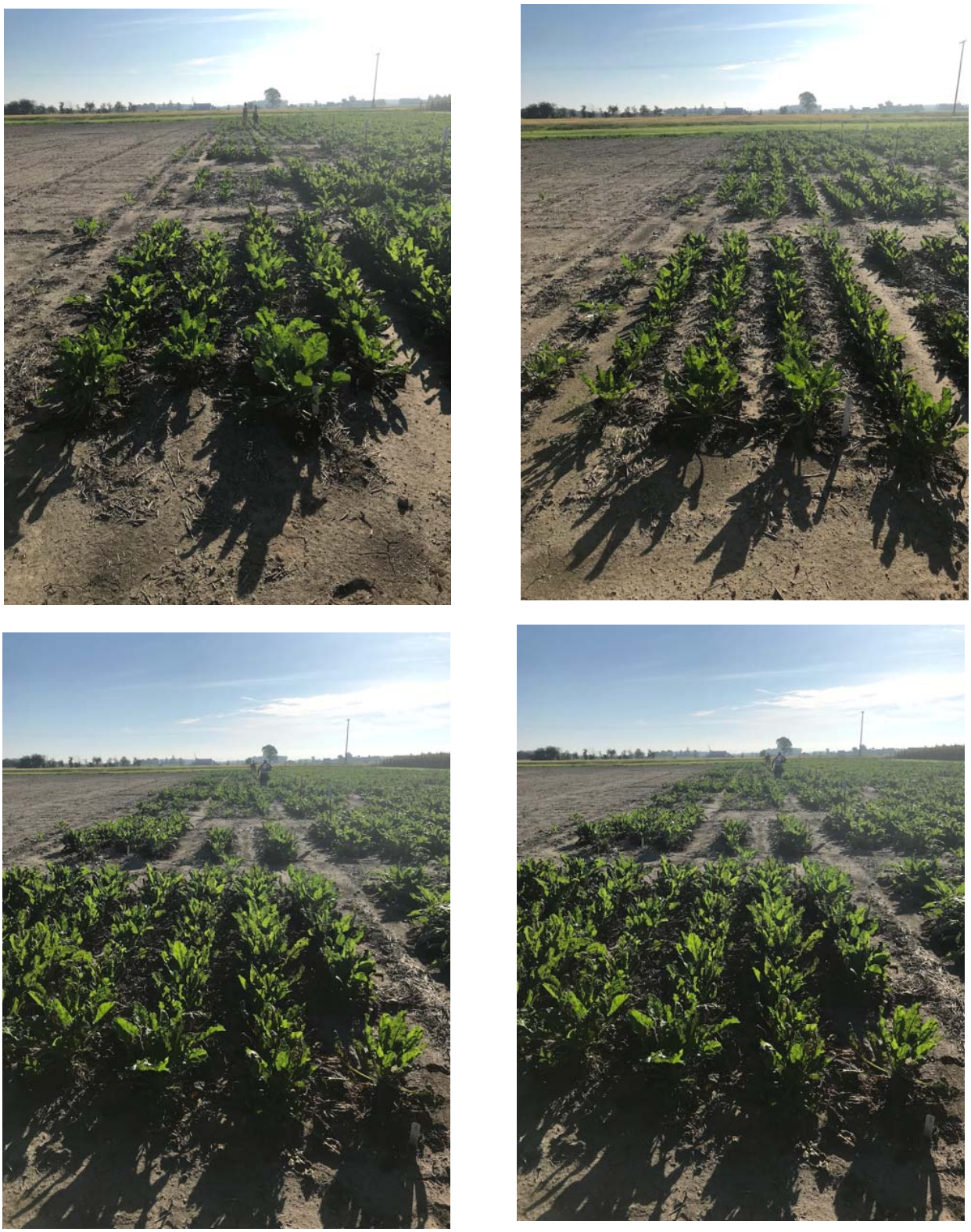

Figure 12. Sugarbeet Rhizoctonia management experimental research plots treated with Elatus at a rate of 1.7 fl oz/A banded application at 6-8 leaf growth stage (17 Sep).

MSU Weed Science Research Program

Sugarbeet tolerance to tiafenacil from preplant and preemergence applications

Trial ID: SB01-18 Study Dir.: Sprague, Powell, Stiles
Conducted: SVREC Investigator: Christy Sprague

Planting Date:	Apr-30-2018	**Row Spacing:**	30 IN
Variety:	Crystal G515	**No. of Reps:**	4
Population:	4.375 " spacing	**% OM:**	2.3
Soil Type:	CL clay loam	**pH:**	8.0
Plot Size:	10 X 30 FT	**Study Design:**	Randomized Complete Block (RCB)

Tillage/Previous Crops: Fall moldboard plowed; early spring field cultivated; planted into a stale seedbed.
Fertilizer: Urea + ESN was applied preemergence at 140 lb N/A.

Crop and Weed Description

Weed	Code	Common Name	Scientific Name
1	POLCO	buckwheat, wild	Polygonum convolvulus
Crop	**Code**	**Common Name**	
1	BETVU	Sugarbeet	

Application Description

	A	B	C
Application Timing:	7 DBP	3 DBP	PRE
Date Treated:	Apr-23-2018	Apr-27-2018	Apr-30-2018
Time Treated:	4:30 PM	10:00 AM	11:00 AM
% Cloud Cover:	10	70	0
Air Temp., Unit:	69 F	62 F	60 F
% Relative Humidity:	32	27	22
Wind Speed/Unit/Dir:	7 mph E	4 mph W	5 mph W
Soil Temp, Unit:	48 F	57 F	47 F
Leaf Moist/Dew Presence (Y/N):	5	5	5
Soil Moist:	3	3	4

Crop Stage at Each Application

	A	B	C
Crop 1 Name:	BETVU	BETVU	BETVU
Height:			
Stage:			

Weed Stage at Each Application

	A	B	C
Weed 1 Name:	POLCO	POLCO	POLCO
Height:			
Stage:			

Weed Density

	1
Date:	Apr-30-2018
Weed Name:	POLCO
Density:	3 FT2

Application Equipment

Appl	Sprayer Type	Ground Speed	Nozzle Type	Nozzle Size	Nozzle Height	Nozzle Spacing	Boom Width	Spray Volume	Carrier	Operation Pressure
A	CUB	3.8 mph	AIXR	11003	20 "	20 "	100 "	19 GPA	WATER	30 PSI
B	CUB	3.8 mph	AIXR	11003	20 "	20 "	100 "	19 GPA	WATER	30 PSI
C	CUB	3.8 mph	AIXR	11003	20 "	20 "	100 "	19 GPA	WATER	30 PSI

Comments: Roundup PowerMax at 32 fl oz + Stinger at 3 fl oz + AMS 17 lb/100 gal was applied postemergence on May 23 and June 19 to keep the area weed-free.

Michigan State University

Sugarbeet tolerance to tiafenacil from preplant and preemergence applications
Trial ID: SB01-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	BETVU May-21-2018 stand count 30' LT 21 DA-C 0	BETVU May-21-2018 stand count 30' RT 21 DA-C 0	BETVU May-21-2018 stand count 30' AVE 21 DA-C 0	BETAVU May-23-2018 injury percent 23 DA-C 0	POLCO May-23-2018 control percent 23 DA-C 0
	Pest Code											
	Crop Code											
	Rating Date											
	Rating Type											
	Rating Unit											
	Trt-Eval Interval											
	Number of Decimals											
1	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	7 DBP	A	57	59	58	15	71
1	MSO		L	0.5	% v/v	7 DBP	A					
2	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	7 DBP	A	30	31	30	55	93
2	MSO		L	0.5	% v/v	7 DBP	A					
3	Tiafenacil (DCC-3825)	2.83	L	9	fl oz/a	7 DBP	A	20	20	20	88	94
3	MSO		L	0.5	% v/v	7 DBP	A					
4	Gramoxone	2	SL	4	pt/a	7 DBP	A	70	71	70	0	0
4	Surfactant		L	0.25	% v/v	7 DBP	A					
5	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	3 DBP	B	51	54	52	21	89
5	MSO		L	0.5	% v/v	3 DBP	B					
6	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	3 DBP	B	26	33	30	59	99
6	MSO		L	0.5	% v/v	3 DBP	B					
7	Tiafenacil (DCC-3825)	2.83	L	9	fl oz/a	3 DBP	B	15	23	19	85	99
7	MSO		L	0.5	% v/v	3 DBP	B					
8	Gramoxone	2	SL	4	pt/a	3 DBP	B	68	70	69	0	0
8	Surfactant		L	0.25	% v/v	3 DBP	B					
9	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	PRE	C	72	67	69	7	98
9	MSO		L	0.5	% v/v	PRE	C					
10	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	PRE	C	39	41	40	46	100
10	MSO		L	0.5	% v/v	PRE	C					
11	Tiafenacil (DCC-3825)	2.83	L	9	fl oz/a	PRE	C	23	31	27	81	99
11	MSO		L	0.5	% v/v	PRE	C					
12	Gramoxone	2	SL	4	pt/a	PRE	C	71	70	71	0	0
12	Surfactant		L	0.25	% v/v	PRE	C					
13	Untreated							75	68	72	0	0
14	Sharpen	2.85	L	0.5	fl oz/a	7 DBP	A	60	58	59	21	86
14	MSO		L	1	% v/v	7 DBP	A					
15	Sharpen	2.85	L	0.5	fl oz/a	3 DBP	B	45	41	43	49	94
15	MSO		L	1	% v/v	3 DBP	B					
16	Sharpen	2.85	L	0.5	fl oz/a	PRE	C	68	59	63	34	90
16	MSO		L	1	% v/v	PRE	C					
	LSD P=.05							12.2	13.8	10.7	17.0	9.3
	Standard Deviation							8.6	9.7	7.5	11.9	6.5
	CV							17.41	19.5	15.26	34.09	9.41

Missing data estimates are included in columns:Average=10,11,12,13

Michigan State University

Sugarbeet tolerance to tiafenacil from preplant and preemergence applications
Trial ID: SB01-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	BETVU May-30-2018 injury percent 30 DA-C 0	BETVU Jun-19-2018 injury percent 50 DA-C 0	BETVU Jul-3-2018 injury percent 64 DA-C 0	BETVU Sep-18-2018 stand count 100' row 141 DA-C 0	BETVU Sep-18-2018 % sugar 141 DA-C 1
1	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	7 DBP	A	22	9	4	184	15.1
1	MSO		L	0.5	% v/v	7 DBP	A					
2	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	7 DBP	A	64	40	33	110	15.3
2	MSO		L	0.5	% v/v	7 DBP	A					
3	Tiafenacil (DCC-3825)	2.83	L	9	fl oz/a	7 DBP	A	77	56	54	96	14.3
3	MSO		L	0.5	% v/v	7 DBP	A					
4	Gramoxone	2	SL	4	pt/a	7 DBP	A	0	0	0	185	15.3
4	Surfactant		L	0.25	% v/v	7 DBP	A					
5	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	3 DBP	B	26	14	5	163	15.2
5	MSO		L	0.5	% v/v	3 DBP	B					
6	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	3 DBP	B	66	45	49	113	14.5
6	MSO		L	0.5	% v/v	3 DBP	B					
7	Tiafenacil (DCC-3825)	2.83	L	9	fl oz/a	3 DBP	B	84	64	60	89	14.8
7	MSO		L	0.5	% v/v	3 DBP	B					
8	Gramoxone	2	SL	4	pt/a	3 DBP	B	0	0	0	202	15.4
8	Surfactant		L	0.25	% v/v	3 DBP	B					
9	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	PRE	C	16	6	2	213	15.6
9	MSO		L	0.5	% v/v	PRE	C					
10	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	PRE	C	55	30	22	155	15.1
10	MSO		L	0.5	% v/v	PRE	C					
11	Tiafenacil (DCC-3825)	2.83	L	9	fl oz/a	PRE	C	79	50	35	113	14.7
11	MSO		L	0.5	% v/v	PRE	C					
12	Gramoxone	2	SL	4	pt/a	PRE	C	0	0	0	176	15.3
12	Surfactant		L	0.25	% v/v	PRE	C					
13	Untreated							0	0	0	204	15.6
14	Sharpen	2.85	L	0.5	fl oz/a	7 DBP	A	34	23	16	139	14.9
14	MSO		L	1	% v/v	7 DBP	A					
15	Sharpen	2.85	L	0.5	fl oz/a	3 DBP	B	51	35	18	162	14.9
15	MSO		L	1	% v/v	3 DBP	B					
16	Sharpen	2.85	L	0.5	fl oz/a	PRE	C	46	18	4	177	15.3
16	MSO		L	1	% v/v	PRE	C					
LSD P=.05								17.2	14.2	14.4	44.0	0.75
Standard Deviation								12.0	10.0	10.1	30.9	0.52
CV								31.08	41.14	53.75	19.92	3.46

Missing data estimates are included in columns:Average=10,11,12,13

Michigan State University

Sugarbeet tolerance to tiafenacil from preplant and preemergence applications
Trial ID: SB01-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Pest Code											
Crop Code								BETVU	BETVU	BETVU
Rating Date								Sep-24-2018	Sep-18-2018	Sep-18-2018
Rating Type								yield	RWST	RWSA
Rating Unit								ton/acre	#/ ton	#/ acre
Trt-Eval Interval								147 DA-C	141 DA-C	141 DA-C
Number of Decimals								1	0	0
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code			
1	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	7 DBP	A	26.0	214	5562
1	MSO		L	0.5	% v/v	7 DBP	A			
2	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	7 DBP	A	21.1	217	4585
2	MSO		L	0.5	% v/v	7 DBP	A			
3	Tiafenacil (DCC-3825)	2.83	L	9	fl oz/a	7 DBP	A	16.2	200	3232
3	MSO		L	0.5	% v/v	7 DBP	A			
4	Gramoxone	2	SL	4	pt/a	7 DBP	A	25.4	218	5360
4	Surfactant		L	0.25	% v/v	7 DBP	A			
5	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	3 DBP	B	26.5	215	5716
5	MSO		L	0.5	% v/v	3 DBP	B			
6	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	3 DBP	B	18.9	205	3879
6	MSO		L	0.5	% v/v	3 DBP	B			
7	Tiafenacil (DCC-3825)	2.83	L	9	fl oz/a	3 DBP	B	14.6	209	3039
7	MSO		L	0.5	% v/v	3 DBP	B			
8	Gramoxone	2	SL	4	pt/a	3 DBP	B	25.1	220	5508
8	Surfactant		L	0.25	% v/v	3 DBP	B			
9	Tiafenacil (DCC-3825)	2.83	L	3	fl oz/a	PRE	C	28.5	223	6368
9	MSO		L	0.5	% v/v	PRE	C			
10	Tiafenacil (DCC-3825)	2.83	L	6	fl oz/a	PRE	C	23.4	215	5023
10	MSO		L	0.5	% v/v	PRE	C			
11	Tiafenacil (DCC-3825)	2.83	L	9	fl oz/a	PRE	C	18.9	207	4474
11	MSO		L	0.5	% v/v	PRE	C			
12	Gramoxone	2	SL	4	pt/a	PRE	C	25.4	217	5528
12	Surfactant		L	0.25	% v/v	PRE	C			
13	Untreated							27.2	222	6036
14	Sharpen	2.85	L	0.5	fl oz/a	7 DBP	A	23.3	211	4948
14	MSO		L	1	% v/v	7 DBP	A			
15	Sharpen	2.85	L	0.5	fl oz/a	3 DBP	B	22.2	211	4694
15	MSO		L	1	% v/v	3 DBP	B			
16	Sharpen	2.85	L	0.5	fl oz/a	PRE	C	23.2	217	5049
16	MSO		L	1	% v/v	PRE	C			
LSD P=.05								5.21	13.4	1142.9
Standard Deviation								3.65	9.4	800.3
CV								15.97	4.37	16.21

Missing data estimates are included in columns:Average=10,11,12,13

MSU Weed Science Research Program

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp

Trial ID: SB02-18 Study Dir.: Sprague, Powell, Stiles
Conducted: SVREC Investigator: Christy Sprague

Planting Date:	Apr-23-2018	**Row Spacing:**	30 IN
Variety:	Crystal G515	**No. of Reps:**	4
Population:	4.375 " spacing	**% OM:**	2.3
Soil Type:	CL clay loam	**pH:**	8.0
Plot Size:	10 X 30 FT	**Study Design:**	Randomized Complete Block (RCB)

Tillage/Previous Crops: Fall moldboard plow; early spring field cultivated; planted into a stale seedbed.
Fertilizer:

Crop and Weed Description

Weed	Code	Common Name	Scientific Name
1	POLCO	buckwheat, wild	Polygonum convolvulus
2	CHEAL	lambsquarters, common	Chenopodium album
3	AMAPO	amaranth, Powell	Amaranthus powellii
Crop	**Code**	**Common Name**	
1	BETVU	Sugarbeet	

Application Description

	A	B	C
Application Timing:	PRE	2-leaf	6-8 leaf
Date Treated:	Apr-23-2018	May-23-2018	Jun-19-2018
Time Treated:	4:45 PM	2:00 PM	11:30 AM
% Cloud Cover:	10	0	95
Air Temp., Unit:	69 F	75 F	75 F
% Relative Humidity:	32	36	39
Wind Speed/Unit/Dir:	8 mph E	1 mph W	1 mph W
Soil Temp, Unit:	48 F	68 F	73 F
Leaf Moist/Dew Presence (Y/N):	5	3	5
Soil Moist:	3	3	4

Crop Stage at Each Application

	A	B	C
Crop 1 Name:	BETVU	BETVU	BETVU
Height:		1 "	8 "
Stage:		2L	8L

Weed Stage at Each Application

	A	B	C
Weed 1 Name:	POLCO	POLCO	POLCO
Height:		3-4 " (3.5)	2-4 " (3)
Stage:		2-4L	4-8L
Weed 2 Name:	CHEAL	CHEAL	CHEAL
Height:		1 "	1-2 " (1.5)
Stage:		2-4L	2-6L
Weed 3 Name:	AMAPO	AMAPO	AMAPO
Height:			1-2 " (1.5)
Stage:			6-8L

Application Equipment

Appl	Sprayer Type	Ground Speed	Nozzle Type	Nozzle Size	Nozzle Height	Nozzle Spacing	Boom Width	Spray Volume	Carrier	Operation Pressure
A	CUB	3.8 mph	AIXR	11003	20 "	20 "	100 "	19 GPA	WATER	30 psi
B	CUB	3.8 mph	AIXR	11003	23 "	20 "	100 "	19 GPA	WATER	30 psi
C	CUB	3.8 mph	AIXR	11003	24 "	20 "	100 "	19 GPA	WATER	30 psi

Comments:

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	BETVU injury	POLCO control	CHEAL control	BETVU injury	POLCO control
	Pest Code								POLCO	CHEAL		POLCO
	Crop Code							BETVU			BETVU	
	Rating Date							May-30-2018	May-30-2018	May-30-2018	Jun-19-2018	Jun-19-2018
	Rating Type							injury	control	control	injury	control
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							7 DA-B	7 DA-B	7 DA-B	0 DA-C	0 DA-C
	Number of Decimals							0	0	0	0	0
1	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	1	64	95	0	91
1	AMS		WG	17	lb/100 gal	2 leaf	B					
1	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
1	AMS		WG	17	lb/100 gal	6-8 leaf	C					
2	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B	9	71	100	3	88
2	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
2	AMS		WG	17	lb/100 gal	2 leaf	B					
2	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C					
2	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
2	AMS		WG	17	lb/100 gal	6-8 leaf	C					
3	Warrant	3	L	3	pt/a	2 leaf	B	2	60	67	0	77
3	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
3	AMS		WG	17	lb/100 gal	2 leaf	B					
3	Warrant	3	L	3	pt/a	6-8 leaf	C					
3	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
3	AMS		WG	17	lb/100 gal	6-8 leaf	C					
4	Outlook	6	L	12	fl oz/a	2 leaf	B	6	69	92	1	85
4	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
4	AMS		WG	17	lb/100 gal	2 leaf	B					
4	Outlook	6	L	12	fl oz/a	6-8 leaf	C					
4	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
4	AMS		WG	17	lb/100 gal	6-8 leaf	C					
5	Ethofumesate	4	L	2	pt/a	PRE	A	3	84	100	0	95
5	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B					
5	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
5	AMS		WG	17	lb/100 gal	2 leaf	B					
5	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C					
5	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
5	AMS		WG	17	lb/100 gal	6-8 leaf	C					
6	Ethofumesate	4	L	2	pt/a	PRE	A	11	80	87	4	93
6	Warrant	3	L	3	pt/a	2 leaf	B					
6	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
6	AMS		WG	17	lb/100 gal	2 leaf	B					
6	Warrant	3	L	3	pt/a	6-8 leaf	C					
6	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
6	AMS		WG	17	lb/100 gal	6-8 leaf	C					
7	Ethofumesate	4	L	2	pt/a	PRE	A	18	83	99	4	94
7	Outlook	6	L	12	fl oz/a	2 leaf	B					
7	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
7	AMS		WG	17	lb/100 gal	2 leaf	B					
7	Outlook	6	L	12	fl oz/a	6-8 leaf	C					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
7	AMS		WG	17	lb/100 gal	6-8 leaf	C					

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	BETVU	POLCO	CHEAL	BETVU	POLCO
	Pest Code								POLCO	CHEAL		POLCO
	Crop Code							BETVU			BETVU	
	Rating Date							May-30-2018	May-30-2018	May-30-2018	Jun-19-2018	Jun-19-2018
	Rating Type							injury	control	control	injury	control
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							7 DA-B	7 DA-B	7 DA-B	0 DA-C	0 DA-C
	Number of Decimals							0	0	0	0	0
8	Ethofumesate	4	L	2	pt/a	PRE	A	17	90	100	0	94
8	Ethofumesate	4	L	2	pt/a	2 leaf	B					
8	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
8	Destiny HC		L	1.5	pt/a	2 leaf	B					
8	AMS		WG	17	lb/100 gal	2 leaf	B					
8	Ethofumesate	4	L	2	pt/a	6-8 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
8	Destiny HC		L	1.5	pt/a	6-8 leaf	C					
8	AMS		WG	17	lb/100 gal	6-8 leaf	C					
9	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	6	85	100	1	88
9	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B					
9	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
9	AMS		WG	17	lb/100 gal	2 leaf	B					
9	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
9	AMS		WG	17	lb/100 gal	6-8 leaf	C					
10	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	11	75	80	3	88
10	Warrant	3	L	3	pt/a	2 leaf	B					
10	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
10	AMS		WG	17	lb/100 gal	2 leaf	B					
10	Warrant	3	L	3	pt/a	6-8 leaf	C					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
10	AMS		WG	17	lb/100 gal	6-8 leaf	C					
11	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	15	70	95	1	88
11	Outlook	6	L	12	fl oz/a	2 leaf	B					
11	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
11	AMS		WG	17	lb/100 gal	2 leaf	B					
11	Outlook	6	L	12	fl oz/a	6-8 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
11	AMS		WG	17	lb/100 gal	6-8 leaf	C					
12	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	6	84	97	0	96
12	Ethofumesate	4	L	2	pt/a	2 leaf	B					
12	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
12	Destiny HC		L	1.5	pt/a	2 leaf	B					
12	AMS		WG	17	lb/100 gal	2 leaf	B					
12	Ethofumesate	4	L	2	pt/a	6-8 leaf	C					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
12	Destiny HC		L	1.5	pt/a	6-8 leaf	C					
12	AMS		WG	17	lb/100 gal	6-8 leaf	C					
13	Ethofumesate	4	L	2	pt/a	PRE	A	14	98	100	3	91
13	Betamix	1.3	L	2	pt/a	2 leaf	B					
13	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
13	AMS		WG	17	lb/100 gal	2 leaf	B					
13	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
13	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
13	AMS		WG	17	lb/100 gal	6-8 leaf	C					

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code					
Pest Code									POLCO	CHEAL		POLCO
Crop Code								BETVU			BETVU	
Rating Date								May-30-2018	May-30-2018	May-30-2018	Jun-19-2018	Jun-19-2018
Rating Type								injury	control	control	injury	control
Rating Unit								percent	percent	percent	percent	percent
Trt-Eval Interval								7 DA-B	7 DA-B	7 DA-B	0 DA-C	0 DA-C
Number of Decimals								0	0	0	0	0
14	Ethofumesate	4	L	2	pt/a	PRE	A	11	97	100	0	90
14	Betamix	1.3	L	2	pt/a	2 leaf	B					
14	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
14	AMS		WG	17	lb/100 gal	2 leaf	B					
14	Dual II Magnum	7.64	L	1.33	pt/a	6-8 leaf	C					
14	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
14	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
14	AMS		WG	17	lb/100 gal	6-8 leaf	C					
15	Ethofumesate	4	L	2	pt/a	PRE	A	13	97	99	3	89
15	Betamix	1.3	L	2	pt/a	2 leaf	B					
15	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
15	AMS		WG	17	lb/100 gal	2 leaf	B					
15	Warrant	3	L	3	pt/a	6-8 leaf	C					
15	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
15	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
15	AMS		WG	17	lb/100 gal	6-8 leaf	C					
16	Ethofumesate	4	L	2	pt/a	PRE	A	14	99	100	6	93
16	Betamix	1.3	L	2	pt/a	2 leaf	B					
16	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
16	AMS		WG	17	lb/100 gal	2 leaf	B					
16	Outlook	6	L	21	fl oz/a	6-8 leaf	C					
16	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
16	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
16	AMS		WG	17	lb/100 gal	6-8 leaf	C					
LSD P=.05								12.0	13.8	8.3	3.3	11.9
Standard Deviation								8.4	9.7	5.8	2.3	8.4
CV								86.24	11.85	6.14	135.35	9.34

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	CHEAL	AMAPO	BETVU	CHEAL	POLCO
	Pest Code							CHEAL	AMAPO		CHEAL	POLCO
	Crop Code									BETVU		
	Rating Date							Jun-19-2018	Jun-19-2018	Jul-3-2018	Jul-3-2018	Jul-3-2018
	Rating Type							control	control	injury	control	control
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							0 DA-C	0 DA-C	14 DA-C	14 DA-C	14 DA-C
	Number of Decimals							0	0	0	0	0
1	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	94	98	0	98	93
1	AMS		WG	17	lb/100 gal	2 leaf	B					
1	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
1	AMS		WG	17	lb/100 gal	6-8 leaf	C					
2	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B	98	100	0	99	93
2	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
2	AMS		WG	17	lb/100 gal	2 leaf	B					
2	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C					
2	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
2	AMS		WG	17	lb/100 gal	6-8 leaf	C					
3	Warrant	3	L	3	pt/a	2 leaf	B	85	100	0	88	84
3	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
3	AMS		WG	17	lb/100 gal	2 leaf	B					
3	Warrant	3	L	3	pt/a	6-8 leaf	C					
3	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
3	AMS		WG	17	lb/100 gal	6-8 leaf	C					
4	Outlook	6	L	12	fl oz/a	2 leaf	B	89	95	0	100	88
4	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
4	AMS		WG	17	lb/100 gal	2 leaf	B					
4	Outlook	6	L	12	fl oz/a	6-8 leaf	C					
4	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
4	AMS		WG	17	lb/100 gal	6-8 leaf	C					
5	Ethofumesate	4	L	2	pt/a	PRE	A	94	100	0	100	96
5	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B					
5	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
5	AMS		WG	17	lb/100 gal	2 leaf	B					
5	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C					
5	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
5	AMS		WG	17	lb/100 gal	6-8 leaf	C					
6	Ethofumesate	4	L	2	pt/a	PRE	A	89	100	0	98	95
6	Warrant	3	L	3	pt/a	2 leaf	B					
6	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
6	AMS		WG	17	lb/100 gal	2 leaf	B					
6	Warrant	3	L	3	pt/a	6-8 leaf	C					
6	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
6	AMS		WG	17	lb/100 gal	6-8 leaf	C					
7	Ethofumesate	4	L	2	pt/a	PRE	A	91	100	0	100	98
7	Outlook	6	L	12	fl oz/a	2 leaf	B					
7	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
7	AMS		WG	17	lb/100 gal	2 leaf	B					
7	Outlook	6	L	12	fl oz/a	6-8 leaf	C					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
7	AMS		WG	17	lb/100 gal	6-8 leaf	C					

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	CHEAL	AMAPO	BETVU	CHEAL	POLCO
	Pest Code							CHEAL	AMAPO		CHEAL	POLCO
	Crop Code									BETVU		
	Rating Date							Jun-19-2018	Jun-19-2018	Jul-3-2018	Jul-3-2018	Jul-3-2018
	Rating Type							control	control	injury	control	control
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							0 DA-C	0 DA-C	14 DA-C	14 DA-C	14 DA-C
	Number of Decimals							0	0	0	0	0
8	Ethofumesate	4	L	2	pt/a	PRE	A	96	100	1	99	98
8	Ethofumesate	4	L	2	pt/a	2 leaf	B					
8	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
8	Destiny HC		L	1.5	pt/a	2 leaf	B					
8	AMS		WG	17	lb/100 gal	2 leaf	B					
8	Ethofumesate	4	L	2	pt/a	6-8 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
8	Destiny HC		L	1.5	pt/a	6-8 leaf	C					
8	AMS		WG	17	lb/100 gal	6-8 leaf	C					
9	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	96	100	0	100	91
9	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B					
9	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
9	AMS		WG	17	lb/100 gal	2 leaf	B					
9	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
9	AMS		WG	17	lb/100 gal	6-8 leaf	C					
10	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	83	100	0	90	91
10	Warrant	3	L	3	pt/a	2 leaf	B					
10	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
10	AMS		WG	17	lb/100 gal	2 leaf	B					
10	Warrant	3	L	3	pt/a	6-8 leaf	C					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
10	AMS		WG	17	lb/100 gal	6-8 leaf	C					
11	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	93	100	0	100	94
11	Outlook	6	L	12	fl oz/a	2 leaf	B					
11	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
11	AMS		WG	17	lb/100 gal	2 leaf	B					
11	Outlook	6	L	12	fl oz/a	6-8 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
11	AMS		WG	17	lb/100 gal	6-8 leaf	C					
12	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	96	100	0	99	96
12	Ethofumesate	4	L	2	pt/a	2 leaf	B					
12	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
12	Destiny HC		L	1.5	pt/a	2 leaf	B					
12	AMS		WG	17	lb/100 gal	2 leaf	B					
12	Ethofumesate	4	L	2	pt/a	6-8 leaf	C					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
12	Destiny HC		L	1.5	pt/a	6-8 leaf	C					
12	AMS		WG	17	lb/100 gal	6-8 leaf	C					
13	Ethofumesate	4	L	2	pt/a	PRE	A	91	93	0	100	98
13	Betamix	1.3	L	2	pt/a	2 leaf	B					
13	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
13	AMS		WG	17	lb/100 gal	2 leaf	B					
13	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
13	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
13	AMS		WG	17	lb/100 gal	6-8 leaf	C					

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	CHEAL	AMAPO	BETVU	CHEAL	POLCO
	Pest Code							CHEAL	AMAPO		CHEAL	POLCO
	Crop Code									BETVU		
	Rating Date							Jun-19-2018	Jun-19-2018	Jul-3-2018	Jul-3-2018	Jul-3-2018
	Rating Type							control	control	injury	control	control
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							0 DA-C	0 DA-C	14 DA-C	14 DA-C	14 DA-C
	Number of Decimals							0	0	0	0	0
14	Ethofumesate	4	L	2	pt/a	PRE	A	91	99	0	100	96
14	Betamix	1.3	L	2	pt/a	2 leaf	B					
14	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
14	AMS		WG	17	lb/100 gal	2 leaf	B					
14	Dual II Magnum	7.64	L	1.33	pt/a	6-8 leaf	C					
14	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
14	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
14	AMS		WG	17	lb/100 gal	6-8 leaf	C					
15	Ethofumesate	4	L	2	pt/a	PRE	A	86	100	0	99	97
15	Betamix	1.3	L	2	pt/a	2 leaf	B					
15	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
15	AMS		WG	17	lb/100 gal	2 leaf	B					
15	Warrant	3	L	3	pt/a	6-8 leaf	C					
15	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
15	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
15	AMS		WG	17	lb/100 gal	6-8 leaf	C					
16	Ethofumesate	4	L	2	pt/a	PRE	A	89	98	0	100	96
16	Betamix	1.3	L	2	pt/a	2 leaf	B					
16	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
16	AMS		WG	17	lb/100 gal	2 leaf	B					
16	Outlook	6	L	21	fl oz/a	6-8 leaf	C					
16	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
16	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
16	AMS		WG	17	lb/100 gal	6-8 leaf	C					
	LSD P=.05							8.2	5.4	0.5	5.8	6.8
	Standard Deviation							5.7	3.8	0.4	4.0	4.8
	CV							6.3	3.87	809.04	4.11	5.11

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Pest Code							AMAPO				
Crop Code								BETVU	BETVU	BETVU	BETVU
Rating Date							Jul-3-2018	Sep-18-2018	Sep-18-2018	Sep-18-2018	Sep-18-2018
Rating Type							control	stand count	% sugar	yield	RWST
Rating Unit							percent	100' row		ton/acre	#/ton
Trt-Eval Interval							14 DA-C	148 DA-A	148 DA-A	148 DA-A	148 DA-A
Number of Decimals							0	0	1	1	0
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code				
1	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	97	200	15.5	27.2	220
1	AMS		WG	17	lb/100 gal	2 leaf	B					
1	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
1	AMS		WG	17	lb/100 gal	6-8 leaf	C					
2	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B	100	189	15.3	24.5	218
2	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
2	AMS		WG	17	lb/100 gal	2 leaf	B					
2	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C					
2	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
2	AMS		WG	17	lb/100 gal	6-8 leaf	C					
3	Warrant	3	L	3	pt/a	2 leaf	B	100	207	15.3	23.7	217
3	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
3	AMS		WG	17	lb/100 gal	2 leaf	B					
3	Warrant	3	L	3	pt/a	6-8 leaf	C					
3	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
3	AMS		WG	17	lb/100 gal	6-8 leaf	C					
4	Outlook	6	L	12	fl oz/a	2 leaf	B	100	188	15.3	23.3	216
4	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
4	AMS		WG	17	lb/100 gal	2 leaf	B					
4	Outlook	6	L	12	fl oz/a	6-8 leaf	C					
4	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
4	AMS		WG	17	lb/100 gal	6-8 leaf	C					
5	Ethofumesate	4	L	2	pt/a	PRE	A	100	206	15.6	24.9	223
5	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B					
5	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
5	AMS		WG	17	lb/100 gal	2 leaf	B					
5	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C					
5	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
5	AMS		WG	17	lb/100 gal	6-8 leaf	C					
6	Ethofumesate	4	L	2	pt/a	PRE	A	100	180	15.4	21.9	220
6	Warrant	3	L	3	pt/a	2 leaf	B					
6	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
6	AMS		WG	17	lb/100 gal	2 leaf	B					
6	Warrant	3	L	3	pt/a	6-8 leaf	C					
6	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
6	AMS		WG	17	lb/100 gal	6-8 leaf	C					
7	Ethofumesate	4	L	2	pt/a	PRE	A	99	180	15.1	23.9	214
7	Outlook	6	L	12	fl oz/a	2 leaf	B					
7	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
7	AMS		WG	17	lb/100 gal	2 leaf	B					
7	Outlook	6	L	12	fl oz/a	6-8 leaf	C					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
7	AMS		WG	17	lb/100 gal	6-8 leaf	C					

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code					
	Pest Code							AMAPO				
	Crop Code								BETVU	BETVU	BETVU	BETVU
	Rating Date							Jul-3-2018	Sep-18-2018	Sep-18-2018	Sep-18-2018	Sep-18-2018
	Rating Type							control	stand count	% sugar	yield	RWST
	Rating Unit							percent	100' row		ton/acre	#/ton
	Trt-Eval Interval							14 DA-C	148 DA-A	148 DA-A	148 DA-A	148 DA-A
	Number of Decimals							0	0	1	1	0
8	Ethofumesate	4	L	2	pt/a	PRE	A	100	197	15.1	25.5	214
8	Ethofumesate	4	L	2	pt/a	2 leaf	B					
8	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
8	Destiny HC		L	1.5	pt/a	2 leaf	B					
8	AMS		WG	17	lb/100 gal	2 leaf	B					
8	Ethofumesate	4	L	2	pt/a	6-8 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
8	Destiny HC		L	1.5	pt/a	6-8 leaf	C					
8	AMS		WG	17	lb/100 gal	6-8 leaf	C					
9	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	100	213	15.4	26.5	219
9	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B					
9	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
9	AMS		WG	17	lb/100 gal	2 leaf	B					
9	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
9	AMS		WG	17	lb/100 gal	6-8 leaf	C					
10	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	100	192	15.1	21.5	213
10	Warrant	3	L	3	pt/a	2 leaf	B					
10	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
10	AMS		WG	17	lb/100 gal	2 leaf	B					
10	Warrant	3	L	3	pt/a	6-8 leaf	C					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
10	AMS		WG	17	lb/100 gal	6-8 leaf	C					
11	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	100	206	15.4	26.2	218
11	Outlook	6	L	12	fl oz/a	2 leaf	B					
11	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
11	AMS		WG	17	lb/100 gal	2 leaf	B					
11	Outlook	6	L	12	fl oz/a	6-8 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
11	AMS		WG	17	lb/100 gal	6-8 leaf	C					
12	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	100	193	15.2	25.3	214
12	Ethofumesate	4	L	2	pt/a	2 leaf	B					
12	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
12	Destiny HC		L	1.5	pt/a	2 leaf	B					
12	AMS		WG	17	lb/100 gal	2 leaf	B					
12	Ethofumesate	4	L	2	pt/a	6-8 leaf	C					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
12	Destiny HC		L	1.5	pt/a	6-8 leaf	C					
12	AMS		WG	17	lb/100 gal	6-8 leaf	C					
13	Ethofumesate	4	L	2	pt/a	PRE	A	100	209	15.3	27.1	217
13	Betamix	1.3	L	2	pt/a	2 leaf	B					
13	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
13	AMS		WG	17	lb/100 gal	2 leaf	B					
13	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
13	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
13	AMS		WG	17	lb/100 gal	6-8 leaf	C					

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code					
Pest Code								AMAPO				
Crop Code									BETVU	BETVU	BETVU	BETVU
Rating Date								Jul-3-2018	Sep-18-2018	Sep-18-2018	Sep-18-2018	Sep-18-2018
Rating Type								control	stand count	% sugar	yield	RWST
Rating Unit								percent	100' row		ton/acre	#/ton
Trt-Eval Interval								14 DA-C	148 DA-A	148 DA-A	148 DA-A	148 DA-A
Number of Decimals								0	0	1	1	0
14	Ethofumesate	4	L	2	pt/a	PRE	A	100	200	15.3	24.5	217
14	Betamix	1.3	L	2	pt/a	2 leaf	B					
14	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
14	AMS		WG	17	lb/100 gal	2 leaf	B					
14	Dual II Magnum	7.64	L	1.33	pt/a	6-8 leaf	C					
14	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
14	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
14	AMS		WG	17	lb/100 gal	6-8 leaf	C					
15	Ethofumesate	4	L	2	pt/a	PRE	A	100	211	15.5	24.7	221
15	Betamix	1.3	L	2	pt/a	2 leaf	B					
15	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
15	AMS		WG	17	lb/100 gal	2 leaf	B					
15	Warrant	3	L	3	pt/a	6-8 leaf	C					
15	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
15	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
15	AMS		WG	17	lb/100 gal	6-8 leaf	C					
16	Ethofumesate	4	L	2	pt/a	PRE	A	100	172	15.1	20.8	214
16	Betamix	1.3	L	2	pt/a	2 leaf	B					
16	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B					
16	AMS		WG	17	lb/100 gal	2 leaf	B					
16	Outlook	6	L	21	fl oz/a	6-8 leaf	C					
16	Betamix	1.3	L	3	pt/a	6-8 leaf	C					
16	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C					
16	AMS		WG	17	lb/100 gal	6-8 leaf	C					
LSD P=.05								2.2	30.9	0.54	4.62	9.4
Standard Deviation								1.6	21.6	0.38	3.24	6.6
CV								1.58	11.02	2.47	13.24	3.03

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Pest Code	
Crop Code	BETVU
Rating Date	Sep-18-2018
Rating Type	RWSA
Rating Unit	#/acre
Trt-Eval Interval	148 DA-A
Number of Decimals	0

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	
1	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	5799
1	AMS		WG	17	lb/100 gal	2 leaf	B	
1	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
1	AMS		WG	17	lb/100 gal	6-8 leaf	C	
2	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B	5392
2	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
2	AMS		WG	17	lb/100 gal	2 leaf	B	
2	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C	
2	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
2	AMS		WG	17	lb/100 gal	6-8 leaf	C	
3	Warrant	3	L	3	pt/a	2 leaf	B	5143
3	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
3	AMS		WG	17	lb/100 gal	2 leaf	B	
3	Warrant	3	L	3	pt/a	6-8 leaf	C	
3	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
3	AMS		WG	17	lb/100 gal	6-8 leaf	C	
4	Outlook	6	L	12	fl oz/a	2 leaf	B	5039
4	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
4	AMS		WG	17	lb/100 gal	2 leaf	B	
4	Outlook	6	L	12	fl oz/a	6-8 leaf	C	
4	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
4	AMS		WG	17	lb/100 gal	6-8 leaf	C	
5	Ethofumesate	4	L	2	pt/a	PRE	A	5562
5	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B	
5	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
5	AMS		WG	17	lb/100 gal	2 leaf	B	
5	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C	
5	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
5	AMS		WG	17	lb/100 gal	6-8 leaf	C	
6	Ethofumesate	4	L	2	pt/a	PRE	A	4811
6	Warrant	3	L	3	pt/a	2 leaf	B	
6	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
6	AMS		WG	17	lb/100 gal	2 leaf	B	
6	Warrant	3	L	3	pt/a	6-8 leaf	C	
6	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
6	AMS		WG	17	lb/100 gal	6-8 leaf	C	
7	Ethofumesate	4	L	2	pt/a	PRE	A	5010
7	Outlook	6	L	12	fl oz/a	2 leaf	B	
7	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
7	AMS		WG	17	lb/100 gal	2 leaf	B	
7	Outlook	6	L	12	fl oz/a	6-8 leaf	C	
7	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
7	AMS		WG	17	lb/100 gal	6-8 leaf	C	

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Pest Code	
Crop Code	BETVU
Rating Date	Sep-18-2018
Rating Type	RWSA
Rating Unit	#/acre
Trt-Eval Interval	148 DA-A
Number of Decimals	0

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	
8	Ethofumesate	4	L	2	pt/a	PRE	A	5466
8	Ethofumesate	4	L	2	pt/a	2 leaf	B	
8	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
8	Destiny HC		L	1.5	pt/a	2 leaf	B	
8	AMS		WG	17	lb/100 gal	2 leaf	B	
8	Ethofumesate	4	L	2	pt/a	6-8 leaf	C	
8	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
8	Destiny HC		L	1.5	pt/a	6-8 leaf	C	
8	AMS		WG	17	lb/100 gal	6-8 leaf	C	
9	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	5768
9	Dual II Magnum	7.64	L	1	pt/a	2 leaf	B	
9	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
9	AMS		WG	17	lb/100 gal	2 leaf	B	
9	Dual II Magnum	7.64	L	1	pt/a	6-8 leaf	C	
9	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
9	AMS		WG	17	lb/100 gal	6-8 leaf	C	
10	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	4583
10	Warrant	3	L	3	pt/a	2 leaf	B	
10	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
10	AMS		WG	17	lb/100 gal	2 leaf	B	
10	Warrant	3	L	3	pt/a	6-8 leaf	C	
10	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
10	AMS		WG	17	lb/100 gal	6-8 leaf	C	
11	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	5725
11	Outlook	6	L	12	fl oz/a	2 leaf	B	
11	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
11	AMS		WG	17	lb/100 gal	2 leaf	B	
11	Outlook	6	L	12	fl oz/a	6-8 leaf	C	
11	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
11	AMS		WG	17	lb/100 gal	6-8 leaf	C	
12	Dual II Magnum	7.64	L	0.5	pt/a	PRE	A	5429
12	Ethofumesate	4	L	2	pt/a	2 leaf	B	
12	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
12	Destiny HC		L	1.5	pt/a	2 leaf	B	
12	AMS		WG	17	lb/100 gal	2 leaf	B	
12	Ethofumesate	4	L	2	pt/a	6-8 leaf	C	
12	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
12	Destiny HC		L	1.5	pt/a	6-8 leaf	C	
12	AMS		WG	17	lb/100 gal	6-8 leaf	C	
13	Ethofumesate	4	L	2	pt/a	PRE	A	5885
13	Betamix	1.3	L	2	pt/a	2 leaf	B	
13	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
13	AMS		WG	17	lb/100 gal	2 leaf	B	
13	Betamix	1.3	L	3	pt/a	6-8 leaf	C	
13	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
13	AMS		WG	17	lb/100 gal	6-8 leaf	C	

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Michigan State University

Sugarbeet tolerance of overlapping residuals for control of herbicide-resistant waterhemp
Trial ID: SB02-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Pest Code	
Crop Code	BETVU
Rating Date	Sep-18-2018
Rating Type	RWSA
Rating Unit	#/acre
Trt-Eval Interval	148 DA-A
Number of Decimals	0

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	
14	Ethofumesate	4	L	2	pt/a	PRE	A	5325
14	Betamix	1.3	L	2	pt/a	2 leaf	B	
14	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
14	AMS		WG	17	lb/100 gal	2 leaf	B	
14	Dual II Magnum	7.64	L	1.33	pt/a	6-8 leaf	C	
14	Betamix	1.3	L	3	pt/a	6-8 leaf	C	
14	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
14	AMS		WG	17	lb/100 gal	6-8 leaf	C	
15	Ethofumesate	4	L	2	pt/a	PRE	A	5473
15	Betamix	1.3	L	2	pt/a	2 leaf	B	
15	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
15	AMS		WG	17	lb/100 gal	2 leaf	B	
15	Warrant	3	L	3	pt/a	6-8 leaf	C	
15	Betamix	1.3	L	3	pt/a	6-8 leaf	C	
15	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
15	AMS		WG	17	lb/100 gal	6-8 leaf	C	
16	Ethofumesate	4	L	2	pt/a	PRE	A	4458
16	Betamix	1.3	L	2	pt/a	2 leaf	B	
16	Roundup PowerMax	4.5	SL	32	fl oz/a	2 leaf	B	
16	AMS		WG	17	lb/100 gal	2 leaf	B	
16	Outlook	6	L	21	fl oz/a	6-8 leaf	C	
16	Betamix	1.3	L	3	pt/a	6-8 leaf	C	
16	Roundup PowerMax	4.5	SL	22	fl oz/a	6-8 leaf	C	
16	AMS		WG	17	lb/100 gal	6-8 leaf	C	

LSD P=.05	1150.1
Standard Deviation	805.4
CV	15.18

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

MSU Weed Science Research Program

Sugarbeet tolerance and weed control from postemergence applications of Ultra Blazer

Trial ID: SB03-18 Study Dir.: Sprague, Powell, Stiles
Conducted: SVREC Investigator: Christy Sprague

Planting Date: Apr-23-2018
Variety: Crystal G515
Population: 4.375 " spacing
Soil Type: CL clay loam
Plot Size: 10 X 30 FT
Row Spacing: 30 IN
No. of Reps: 4
% OM: 2.3
pH: 8.0
Study Design: Randomized Complete Block (RCB)

Tillage/Previous Crops: Fall moldboard; early spring field cultivate; planted stale seedbed
Fertilizer: 140 lb N/A as urea + ESN

Crop and Weed Description

Weed	Code	Common Name	Scientific Name
1	CHEAL	lambsquarters, common	Chenopodium album
2	POLCO	buckwheat, wild	Polygonum convolvulus
Crop	**Code**	**Common Name**	
1	BETVU	Sugarbeet	

Application Description

	A	B	C
Application Timing:	2 leaf	4-6 leaf	12 leaf
Date Treated:	May-23-2018	Jun-5-2018	Jun-19-2018
Time Treated:	2:30 PM	11:00 AM	1:00 PM
% Cloud Cover:	0	80	95
Air Temp., Unit:	75 F	52 F	75 F
% Relative Humidity:	36	69	59
Wind Speed/Unit/Dir:	1 mph W	7 mph NW	1 mph W
Soil Temp, Unit:	68 F	64 F	73 F
Leaf Moist/Dew Presence (Y/N):	3	5	5
Soil Moist:	3	5	4

Crop Stage at Each Application

	A	B	C
Crop 1 Name:	BETVU	BETVU	BETVU
Height:	1 "	4 "	8 "
Stage:	2L	6L	8-14L

Weed Stage at Each Application

	A	B	C
Weed 1 Name:	CHEAL	CHEAL	CHEAL
Height:	1 "	1-2 " (1.5)	1 "
Stage:	2-4L	4-6L	2-6L
Weed 2 Name:	POLCO	POLCO	POLCO
Height:	3-4 " (3.5)	3-4 " (3.5)	2-4 " (3)
Stage:	2-4L	2-6L	4-8L

Weed Density

	1	2
Date:	Jun-19-2018	Jun-19-2018
Weed Name:	CHEAL	POLCO
Density:	6 FT2	6 FT2

Application Equipment

Appl	Sprayer Type	Ground Speed	Nozzle Type	Nozzle Size	Nozzle Height	Nozzle Spacing	Boom Width	Spray Volume	Carrier	Operation Pressure
A	CUB	3.8 mph	AIXR	11003	23 "	20 "	100 "	19 GAL/AC	WATER	30 PSI
B	CUB	3.8 mph	AIXR	11003	24 "	20 "	100 "	19 GAL/AC	WATER	30 PSI
C	CUB	3.8 mph	AIXR	11003	24 "	20 "	100 "	19 GAL/AC	WATER	30 PSI

Comments:

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Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	BETVU May-30-2018 injury percent 7 DA-A 0	CHEAL May-30-2018 control percent 7 DA-A 0	POLCO May-30-2018 control percent 7 DA-A 0	BETVU Jun-5-2018 injury percent 13 DA-A 0	CHEAL Jun-5-2018 control percent 13 DA-A 0
1	Roundup PowerMax	4.5	SL	22 fl oz/a		2 leaf	A	0	83	55	0	100
1	AMS		WG	17 lb/100 gal		2 leaf	A					
1	Roundup PowerMax	4.5	SL	22 fl oz/a		4-6 leaf	B					
1	AMS		WG	17 lb/100 gal		4-6 leaf	B					
1	Roundup PowerMax	4.5	SL	22 fl oz/a		10-12 leaf	C					
1	AMS		WG	17 lb/100 gal		10-12 leaf	C					
2	Ultra Blazer	2	L	8 fl oz/a		2 leaf	A	39	95	99	13	100
2	Roundup PowerMax	4.5	SL	22 fl oz/a		2 leaf	A					
2	AMS		WG	17 lb/100 gal		2 leaf	A					
2	Ultra Blazer	2	L	8 fl oz/a		4-6 leaf	B					
2	Roundup PowerMax	4.5	SL	22 fl oz/a		4-6 leaf	B					
2	AMS		WG	17 lb/100 gal		4-6 leaf	B					
2	Ultra Blazer	2	L	8 fl oz/a		10-12 leaf	C					
2	Roundup PowerMax	4.5	SL	22 fl oz/a		10-12 leaf	C					
2	AMS		WG	17 lb/100 gal		10-12 leaf	C					
3	Ultra Blazer	2	L	16 fl oz/a		2 leaf	A	39	93	100	19	99
3	Roundup PowerMax	4.5	SL	22 fl oz/a		2 leaf	A					
3	AMS		WG	17 lb/100 gal		2 leaf	A					
3	Ultra Blazer	2	L	16 fl oz/a		4-6 leaf	B					
3	Roundup PowerMax	4.5	SL	22 fl oz/a		4-6 leaf	B					
3	AMS		WG	17 lb/100 gal		4-6 leaf	B					
3	Ultra Blazer	2	L	16 fl oz/a		10-12 leaf	C					
3	Roundup PowerMax	4.5	SL	22 fl oz/a		10-12 leaf	C					
3	AMS		WG	17 lb/100 gal		10-12 leaf	C					
4	Untreated							0	0	0	0	0
5	Ultra Blazer	2	L	16 fl oz/a		2 leaf	A	40	98	100	18	99
5	Roundup PowerMax	4.5	SL	22 fl oz/a		2 leaf	A					
5	AMS		WG	17 lb/100 gal		2 leaf	A					
5	Roundup PowerMax	4.5	SL	22 fl oz/a		4-6 leaf	B					
5	AMS		WG	17 lb/100 gal		4-6 leaf	B					
5	Roundup PowerMax	4.5	SL	22 fl oz/a		10-12 leaf	C					
5	AMS		WG	17 lb/100 gal		10-12 leaf	C					
6	Ultra Blazer	2	L	24 fl oz/a		2 leaf	A	39	99	100	15	98
6	Roundup PowerMax	4.5	SL	22 fl oz/a		2 leaf	A					
6	AMS		WG	17 lb/100 gal		2 leaf	A					
6	Roundup PowerMax	4.5	SL	22 fl oz/a		4-6 leaf	B					
6	AMS		WG	17 lb/100 gal		4-6 leaf	B					
6	Roundup PowerMax	4.5	SL	22 fl oz/a		10-12 leaf	C					
6	AMS		WG	17 lb/100 gal		10-12 leaf	C					

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Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	BETVU May-30-2018 injury percent 7 DA-A 0	CHEAL May-30-2018 control percent 7 DA-A 0	POLCO May-30-2018 control percent 7 DA-A 0	BETVU Jun-5-2018 injury percent 13 DA-A 0	CHEAL Jun-5-2018 control percent 13 DA-A 0
7	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	0	82	61	0	100
7	AMS		WG	17	lb/100 gal	2 leaf	A					
7	Ultra Blazer	2	L	24	fl oz/a	4-6 leaf	B					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
7	AMS		WG	17	lb/100 gal	4-6 leaf	B					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
7	AMS		WG	17	lb/100 gal	10-12 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	0	85	63	0	100
8	AMS		WG	17	lb/100 gal	2 leaf	A					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
8	AMS		WG	17	lb/100 gal	4-6 leaf	B					
8	Ultra Blazer	2	L	24	fl oz/a	10-12 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
8	AMS		WG	17	lb/100 gal	10-12 leaf	C					
9	Ultra Blazer	2	L	24	fl oz/a	2 leaf	A	51	97	99	15	100
9	Ethotron	4	L	12	fl oz/a	2 leaf	A					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
9	AMS		WG	17	lb/100 gal	2 leaf	A					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
9	AMS		WG	17	lb/100 gal	4-6 leaf	B					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
9	AMS		WG	17	lb/100 gal	10-12 leaf	C					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	6	96	68	3	100
10	AMS		WG	17	lb/100 gal	2 leaf	A					
10	Ultra Blazer	2	L	24	fl oz/a	4-6 leaf	B					
10	Ethotron	4	L	12	fl oz/a	4-6 leaf	B					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
10	AMS		WG	17	lb/100 gal	4-6 leaf	B					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
10	AMS		WG	17	lb/100 gal	10-12 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	4	100	69	1	100
11	AMS		WG	17	lb/100 gal	2 leaf	A					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
11	AMS		WG	17	lb/100 gal	4-6 leaf	B					
11	Ultra Blazer	2	L	24	fl oz/a	10-12 leaf	C					
11	Ethotron	4	L	12	fl oz/a	10-12 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
11	AMS		WG	17	lb/100 gal	10-12 leaf	C					

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Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code					
	Pest Code								CHEAL	POLCO		CHEAL
	Crop Code							BETVU			BETVU	
	Rating Date							May-30-2018	May-30-2018	May-30-2018	Jun-5-2018	Jun-5-2018
	Rating Type							injury	control	control	injury	control
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							7 DA-A	7 DA-A	7 DA-A	13 DA-A	13 DA-A
	Number of Decimals							0	0	0	0	0
12	Ethotron	4	L	12	fl oz/a	2 leaf	A	2	100	65	1	100
12	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
12	AMS		WG	17	lb/100 gal	2 leaf	A					
12	Ethotron	4	L	12	fl oz/a	4-6 leaf	B					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
12	AMS		WG	17	lb/100 gal	4-6 leaf	B					
12	Ethotron	4	L	12	fl oz/a	10-12 leaf	C					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
12	AMS		WG	17	lb/100 gal	10-12 leaf	C					
	LSD P=.05							6.5	6.7	7.3	6.8	2.3
	Standard Deviation							4.5	4.7	5.1	4.8	1.6
	CV							24.58	5.47	6.93	67.9	1.73

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Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	POLCO	BETVU	CHEAL	POLCO	BETVU
	Pest Code							POLCO		CHEAL	POLCO	
	Crop Code								BETVU			BETVU
	Rating Date							Jun-5-2018	Jun-19-2018	Jun-19-2018	Jun-19-2018	Jun-26-2018
	Rating Type							control	injury	control	control	injury
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							13 DA-A	14 DA-B	14 DA-B	14 DA-B	7 DA-C
	Number of Decimals							0	0	0	0	0
1	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	79	0	100	84	0
1	AMS		WG	17	lb/100 gal	2 leaf	A					
1	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
1	AMS		WG	17	lb/100 gal	4-6 leaf	B					
1	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
1	AMS		WG	17	lb/100 gal	10-12 leaf	C					
2	Ultra Blazer	2	L	8	fl oz/a	2 leaf	A	90	29	98	99	25
2	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
2	AMS		WG	17	lb/100 gal	2 leaf	A					
2	Ultra Blazer	2	L	8	fl oz/a	4-6 leaf	B					
2	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
2	AMS		WG	17	lb/100 gal	4-6 leaf	B					
2	Ultra Blazer	2	L	8	fl oz/a	10-12 leaf	C					
2	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
2	AMS		WG	17	lb/100 gal	10-12 leaf	C					
3	Ultra Blazer	2	L	16	fl oz/a	2 leaf	A	89	28	99	99	28
3	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
3	AMS		WG	17	lb/100 gal	2 leaf	A					
3	Ultra Blazer	2	L	16	fl oz/a	4-6 leaf	B					
3	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
3	AMS		WG	17	lb/100 gal	4-6 leaf	B					
3	Ultra Blazer	2	L	16	fl oz/a	10-12 leaf	C					
3	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
3	AMS		WG	17	lb/100 gal	10-12 leaf	C					
4	Untreated							0	0	0	0	0
5	Ultra Blazer	2	L	16	fl oz/a	2 leaf	A	96	3	100	100	0
5	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
5	AMS		WG	17	lb/100 gal	2 leaf	A					
5	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
5	AMS		WG	17	lb/100 gal	4-6 leaf	B					
5	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
5	AMS		WG	17	lb/100 gal	10-12 leaf	C					
6	Ultra Blazer	2	L	24	fl oz/a	2 leaf	A	94	4	100	100	1
6	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
6	AMS		WG	17	lb/100 gal	2 leaf	A					
6	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
6	AMS		WG	17	lb/100 gal	4-6 leaf	B					
6	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
6	AMS		WG	17	lb/100 gal	10-12 leaf	C					

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Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	POLCO	BETVU	CHEAL	POLCO	BETVU
	Pest Code							POLCO		CHEAL	POLCO	
	Crop Code								BETVU			BETVU
	Rating Date							Jun-5-2018	Jun-19-2018	Jun-19-2018	Jun-19-2018	Jun-26-2018
	Rating Type							control	injury	control	control	injury
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							13 DA-A	14 DA-B	14 DA-B	14 DA-B	7 DA-C
	Number of Decimals							0	0	0	0	0
7	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	75	25	100	91	9
7	AMS		WG	17	lb/100 gal	2 leaf	A					
7	Ultra Blazer	2	L	24	fl oz/a	4-6 leaf	B					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
7	AMS		WG	17	lb/100 gal	4-6 leaf	B					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
7	AMS		WG	17	lb/100 gal	10-12 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	71	0	100	91	20
8	AMS		WG	17	lb/100 gal	2 leaf	A					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
8	AMS		WG	17	lb/100 gal	4-6 leaf	B					
8	Ultra Blazer	2	L	24	fl oz/a	10-12 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
8	AMS		WG	17	lb/100 gal	10-12 leaf	C					
9	Ultra Blazer	2	L	24	fl oz/a	2 leaf	A	94	5	100	100	2
9	Ethotron	4	L	12	fl oz/a	2 leaf	A					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
9	AMS		WG	17	lb/100 gal	2 leaf	A					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
9	AMS		WG	17	lb/100 gal	4-6 leaf	B					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
9	AMS		WG	17	lb/100 gal	10-12 leaf	C					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	79	28	100	92	13
10	AMS		WG	17	lb/100 gal	2 leaf	A					
10	Ultra Blazer	2	L	24	fl oz/a	4-6 leaf	B					
10	Ethotron	4	L	12	fl oz/a	4-6 leaf	B					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
10	AMS		WG	17	lb/100 gal	4-6 leaf	B					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
10	AMS		WG	17	lb/100 gal	10-12 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	89	0	100	94	24
11	AMS		WG	17	lb/100 gal	2 leaf	A					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
11	AMS		WG	17	lb/100 gal	4-6 leaf	B					
11	Ultra Blazer	2	L	24	fl oz/a	10-12 leaf	C					
11	Ethotron	4	L	12	fl oz/a	10-12 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
11	AMS		WG	17	lb/100 gal	10-12 leaf	C					

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	Pest Code							POLCO		CHEAL	POLCO	
	Crop Code								BETVU			BETVU
	Rating Date							Jun-5-2018	Jun-19-2018	Jun-19-2018	Jun-19-2018	Jun-26-2018
	Rating Type							control	injury	control	control	injury
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							13 DA-A	14 DA-B	14 DA-B	14 DA-B	7 DA-C
	Number of Decimals							0	0	0	0	0
12	Ethotron	4	L	12	fl oz/a	2 leaf	A	83	0	100	94	4
12	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
12	AMS		WG	17	lb/100 gal	2 leaf	A					
12	Ethotron	4	L	12	fl oz/a	4-6 leaf	B					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
12	AMS		WG	17	lb/100 gal	4-6 leaf	B					
12	Ethotron	4	L	12	fl oz/a	10-12 leaf	C					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
12	AMS		WG	17	lb/100 gal	10-12 leaf	C					
	LSD P=.05							12.9	3.9	2.2	6.4	5.9
	Standard Deviation							9.0	2.7	1.5	4.4	4.1
	CV							11.48	26.82	1.66	5.08	39.14

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Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	CHEAL	POLCO	BETVU	CHEAL	POLCO
	Pest Code							CHEAL	POLCO		CHEAL	POLCO
	Crop Code									BETVU		
	Rating Date							Jun-26-2018	Jun-26-2018	Jul-3-2018	Jul-3-2018	Jul-3-2018
	Rating Type							control	control	injury	control	control
	Rating Unit							percent	percent	percent	percent	percent
	Trt-Eval Interval							7 DA-C	7 DA-C	14 DA-C	14 DA-C	14 DA-C
	Number of Decimals							0	0	0	0	0
1	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	100	89	0	100	92
1	AMS		WG	17	lb/100 gal	2 leaf	A					
1	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
1	AMS		WG	17	lb/100 gal	4-6 leaf	B					
1	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
1	AMS		WG	17	lb/100 gal	10-12 leaf	C					
2	Ultra Blazer	2	L	8	fl oz/a	2 leaf	A	100	98	27	100	99
2	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
2	AMS		WG	17	lb/100 gal	2 leaf	A					
2	Ultra Blazer	2	L	8	fl oz/a	4-6 leaf	B					
2	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
2	AMS		WG	17	lb/100 gal	4-6 leaf	B					
2	Ultra Blazer	2	L	8	fl oz/a	10-12 leaf	C					
2	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
2	AMS		WG	17	lb/100 gal	10-12 leaf	C					
3	Ultra Blazer	2	L	16	fl oz/a	2 leaf	A	100	99	28	100	99
3	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
3	AMS		WG	17	lb/100 gal	2 leaf	A					
3	Ultra Blazer	2	L	16	fl oz/a	4-6 leaf	B					
3	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
3	AMS		WG	17	lb/100 gal	4-6 leaf	B					
3	Ultra Blazer	2	L	16	fl oz/a	10-12 leaf	C					
3	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
3	AMS		WG	17	lb/100 gal	10-12 leaf	C					
4	Untreated							0	0	0	0	0
5	Ultra Blazer	2	L	16	fl oz/a	2 leaf	A	100	100	0	99	100
5	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
5	AMS		WG	17	lb/100 gal	2 leaf	A					
5	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
5	AMS		WG	17	lb/100 gal	4-6 leaf	B					
5	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
5	AMS		WG	17	lb/100 gal	10-12 leaf	C					
6	Ultra Blazer	2	L	24	fl oz/a	2 leaf	A	100	100	1	100	100
6	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
6	AMS		WG	17	lb/100 gal	2 leaf	A					
6	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
6	AMS		WG	17	lb/100 gal	4-6 leaf	B					
6	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
6	AMS		WG	17	lb/100 gal	10-12 leaf	C					

Missing data estimates are included in columns:Average=20,22,23
Could not calculate LSD (% mean diff) for columns 11,18 because error mean square = 0.

Michigan State University

Sugarbeet tolerance and weed control from postemergence applications of Ultra Blazer
Trial ID: SB03-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	CHEAL	POLCO	BETVU	CHEAL	POLCO
Pest Code								CHEAL	POLCO		CHEAL	POLCO
Crop Code										BETVU		
Rating Date								Jun-26-2018	Jun-26-2018	Jul-3-2018	Jul-3-2018	Jul-3-2018
Rating Type								control	control	injury	control	control
Rating Unit								percent	percent	percent	percent	percent
Trt-Eval Interval								7 DA-C	7 DA-C	14 DA-C	14 DA-C	14 DA-C
Number of Decimals								0	0	0	0	0
7	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	100	88	3	100	93
7	AMS		WG	17	lb/100 gal	2 leaf	A					
7	Ultra Blazer	2	L	24	fl oz/a	4-6 leaf	B					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
7	AMS		WG	17	lb/100 gal	4-6 leaf	B					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
7	AMS		WG	17	lb/100 gal	10-12 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	100	93	21	100	97
8	AMS		WG	17	lb/100 gal	2 leaf	A					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
8	AMS		WG	17	lb/100 gal	4-6 leaf	B					
8	Ultra Blazer	2	L	24	fl oz/a	10-12 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
8	AMS		WG	17	lb/100 gal	10-12 leaf	C					
9	Ultra Blazer	2	L	24	fl oz/a	2 leaf	A	100	99	0	100	100
9	Ethotron	4	L	12	fl oz/a	2 leaf	A					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
9	AMS		WG	17	lb/100 gal	2 leaf	A					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
9	AMS		WG	17	lb/100 gal	4-6 leaf	B					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
9	AMS		WG	17	lb/100 gal	10-12 leaf	C					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	100	89	2	100	93
10	AMS		WG	17	lb/100 gal	2 leaf	A					
10	Ultra Blazer	2	L	24	fl oz/a	4-6 leaf	B					
10	Ethotron	4	L	12	fl oz/a	4-6 leaf	B					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
10	AMS		WG	17	lb/100 gal	4-6 leaf	B					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
10	AMS		WG	17	lb/100 gal	10-12 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	100	95	29	100	98
11	AMS		WG	17	lb/100 gal	2 leaf	A					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
11	AMS		WG	17	lb/100 gal	4-6 leaf	B					
11	Ultra Blazer	2	L	24	fl oz/a	10-12 leaf	C					
11	Ethotron	4	L	12	fl oz/a	10-12 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
11	AMS		WG	17	lb/100 gal	10-12 leaf	C					

Missing data estimates are included in columns:Average=20,22,23
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Sugarbeet tolerance and weed control from postemergence applications of Ultra Blazer
Trial ID: SB03-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code					
Pest Code								CHEAL	POLCO		CHEAL	POLCO
Crop Code										BETVU		
Rating Date								Jun-26-2018	Jun-26-2018	Jul-3-2018	Jul-3-2018	Jul-3-2018
Rating Type								control	control	injury	control	control
Rating Unit								percent	percent	percent	percent	percent
Trt-Eval Interval								7 DA-C	7 DA-C	14 DA-C	14 DA-C	14 DA-C
Number of Decimals								0	0	0	0	0
12	Ethotron	4	L	12	fl oz/a	2 leaf	A	100	97	5	100	100
12	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
12	AMS		WG	17	lb/100 gal	2 leaf	A					
12	Ethotron	4	L	12	fl oz/a	4-6 leaf	B					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
12	AMS		WG	17	lb/100 gal	4-6 leaf	B					
12	Ethotron	4	L	12	fl oz/a	10-12 leaf	C					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
12	AMS		WG	17	lb/100 gal	10-12 leaf	C					
LSD P=.05								.	8.7	3.7	1.1	5.7
Standard Deviation								0.0	6.1	2.6	0.8	3.9
CV								0.0	6.95	27.26	0.86	4.4

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Michigan State University

Sugarbeet tolerance and weed control from postemergence applications of Ultra Blazer
Trial ID: SB03-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	BETVU	CHEAL	POLCO	BETVU	BETVU
Pest Code												
Crop Code								BETVU			BETVU	BETVU
Rating Date								Jul-10-2018	Jul-10-2018	Jul-10-2018	Sep-18-2018	Sep-18-2018
Rating Type								injury	control	control	weight	% sugar
Rating Unit								percent	percent	percent	lb/plot	
Trt-Eval Interval								21 DA-C	21 DA-C	21 DA-C	148 DA-A	118 DA-A
Number of Decimals								0	0	0		1
1	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	0	100	100	137.8	15.6
1	AMS		WG	17	lb/100 gal	2 leaf	A					
1	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
1	AMS		WG	17	lb/100 gal	4-6 leaf	B					
1	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
1	AMS		WG	17	lb/100 gal	10-12 leaf	C					
2	Ultra Blazer	2	L	8	fl oz/a	2 leaf	A	20	100	100	113.0	15.8
2	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
2	AMS		WG	17	lb/100 gal	2 leaf	A					
2	Ultra Blazer	2	L	8	fl oz/a	4-6 leaf	B					
2	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
2	AMS		WG	17	lb/100 gal	4-6 leaf	B					
2	Ultra Blazer	2	L	8	fl oz/a	10-12 leaf	C					
2	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
2	AMS		WG	17	lb/100 gal	10-12 leaf	C					
3	Ultra Blazer	2	L	16	fl oz/a	2 leaf	A	24	100	100	110.5	15.5
3	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
3	AMS		WG	17	lb/100 gal	2 leaf	A					
3	Ultra Blazer	2	L	16	fl oz/a	4-6 leaf	B					
3	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
3	AMS		WG	17	lb/100 gal	4-6 leaf	B					
3	Ultra Blazer	2	L	16	fl oz/a	10-12 leaf	C					
3	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
3	AMS		WG	17	lb/100 gal	10-12 leaf	C					
4	Untreated							0	0	0	9.0	15.8
5	Ultra Blazer	2	L	16	fl oz/a	2 leaf	A	0	99	100	137.0	15.6
5	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
5	AMS		WG	17	lb/100 gal	2 leaf	A					
5	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
5	AMS		WG	17	lb/100 gal	4-6 leaf	B					
5	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
5	AMS		WG	17	lb/100 gal	10-12 leaf	C					
6	Ultra Blazer	2	L	24	fl oz/a	2 leaf	A	0	100	100	126.0	15.4
6	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
6	AMS		WG	17	lb/100 gal	2 leaf	A					
6	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
6	AMS		WG	17	lb/100 gal	4-6 leaf	B					
6	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
6	AMS		WG	17	lb/100 gal	10-12 leaf	C					

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Michigan State University

Sugarbeet tolerance and weed control from postemergence applications of Ultra Blazer
Trial ID: SB03-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	BETVU	CHEAL	POLCO	BETVU	BETVU
Pest Code												
Crop Code								BETVU			BETVU	BETVU
Rating Date								Jul-10-2018	Jul-10-2018	Jul-10-2018	Sep-18-2018	Sep-18-2018
Rating Type								injury	control	control	weight	% sugar
Rating Unit								percent	percent	percent	lb/plot	
Trt-Eval Interval								21 DA-C	21 DA-C	21 DA-C	148 DA-A	118 DA-A
Number of Decimals								0	0	0		1
7	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	2	100	100	137.0	14.7
7	AMS		WG	17	lb/100 gal	2 leaf	A					
7	Ultra Blazer	2	L	24	fl oz/a	4-6 leaf	B					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
7	AMS		WG	17	lb/100 gal	4-6 leaf	B					
7	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
7	AMS		WG	17	lb/100 gal	10-12 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	21	100	100	119.3	15.1
8	AMS		WG	17	lb/100 gal	2 leaf	A					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
8	AMS		WG	17	lb/100 gal	4-6 leaf	B					
8	Ultra Blazer	2	L	24	fl oz/a	10-12 leaf	C					
8	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
8	AMS		WG	17	lb/100 gal	10-12 leaf	C					
9	Ultra Blazer	2	L	24	fl oz/a	2 leaf	A	0	100	100	128.0	15.2
9	Ethotron	4	L	12	fl oz/a	2 leaf	A					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
9	AMS		WG	17	lb/100 gal	2 leaf	A					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
9	AMS		WG	17	lb/100 gal	4-6 leaf	B					
9	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
9	AMS		WG	17	lb/100 gal	10-12 leaf	C					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	0	100	100	132.5	15.4
10	AMS		WG	17	lb/100 gal	2 leaf	A					
10	Ultra Blazer	2	L	24	fl oz/a	4-6 leaf	B					
10	Ethotron	4	L	12	fl oz/a	4-6 leaf	B					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
10	AMS		WG	17	lb/100 gal	4-6 leaf	B					
10	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
10	AMS		WG	17	lb/100 gal	10-12 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	23	100	100	118.8	14.6
11	AMS		WG	17	lb/100 gal	2 leaf	A					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
11	AMS		WG	17	lb/100 gal	4-6 leaf	B					
11	Ultra Blazer	2	L	24	fl oz/a	10-12 leaf	C					
11	Ethotron	4	L	12	fl oz/a	10-12 leaf	C					
11	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
11	AMS		WG	17	lb/100 gal	10-12 leaf	C					

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Sugarbeet tolerance and weed control from postemergence applications of Ultra Blazer
Trial ID: SB03-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code					
Pest Code									CHEAL	POLCO		
Crop Code								BETVU			BETVU	BETVU
Rating Date								Jul-10-2018	Jul-10-2018	Jul-10-2018	Sep-18-2018	Sep-18-2018
Rating Type								injury	control	control	weight	% sugar
Rating Unit								percent	percent	percent	lb/plot	
Trt-Eval Interval								21 DA-C	21 DA-C	21 DA-C	148 DA-A	118 DA-A
Number of Decimals								0	0	0		1
12	Ethotron	4	L	12	fl oz/a	2 leaf	A	7	100	100	128.5	15.6
12	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A					
12	AMS		WG	17	lb/100 gal	2 leaf	A					
12	Ethotron	4	L	12	fl oz/a	4-6 leaf	B					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B					
12	AMS		WG	17	lb/100 gal	4-6 leaf	B					
12	Ethotron	4	L	12	fl oz/a	10-12 leaf	C					
12	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C					
12	AMS		WG	17	lb/100 gal	10-12 leaf	C					
LSD P=.05								3.6	0.6	.	24.31	0.85
Standard Deviation								2.5	0.4	0.0	16.90	0.59
CV								31.07	0.47	0.0	14.51	3.86

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Michigan State University

Sugarbeet tolerance and weed control from postemergence applications of Ultra Blazer
Trial ID: SB03-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code	BETVU Sep-18-2018 yield ton/acre 148 DA-A 1	BETVU Sep-18-2018 RWST #/ton 118 DA-A 0	BETVU Sep-18-2018 RWSA #/acre 118 DA-A 0
1	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	25.0	224	5612
1	AMS		WG	17	lb/100 gal	2 leaf	A			
1	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
1	AMS		WG	17	lb/100 gal	4-6 leaf	B			
1	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
1	AMS		WG	17	lb/100 gal	10-12 leaf	C			
2	Ultra Blazer	2	L	8	fl oz/a	2 leaf	A	20.5	226	4641
2	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A			
2	AMS		WG	17	lb/100 gal	2 leaf	A			
2	Ultra Blazer	2	L	8	fl oz/a	4-6 leaf	B			
2	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
2	AMS		WG	17	lb/100 gal	4-6 leaf	B			
2	Ultra Blazer	2	L	8	fl oz/a	10-12 leaf	C			
2	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
2	AMS		WG	17	lb/100 gal	10-12 leaf	C			
3	Ultra Blazer	2	L	16	fl oz/a	2 leaf	A	20.1	221	4424
3	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A			
3	AMS		WG	17	lb/100 gal	2 leaf	A			
3	Ultra Blazer	2	L	16	fl oz/a	4-6 leaf	B			
3	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
3	AMS		WG	17	lb/100 gal	4-6 leaf	B			
3	Ultra Blazer	2	L	16	fl oz/a	10-12 leaf	C			
3	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
3	AMS		WG	17	lb/100 gal	10-12 leaf	C			
4	Untreated							1.6	227	387
5	Ultra Blazer	2	L	16	fl oz/a	2 leaf	A	24.9	223	5538
5	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A			
5	AMS		WG	17	lb/100 gal	2 leaf	A			
5	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
5	AMS		WG	17	lb/100 gal	4-6 leaf	B			
5	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
5	AMS		WG	17	lb/100 gal	10-12 leaf	C			
6	Ultra Blazer	2	L	24	fl oz/a	2 leaf	A	22.9	221	5046
6	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A			
6	AMS		WG	17	lb/100 gal	2 leaf	A			
6	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
6	AMS		WG	17	lb/100 gal	4-6 leaf	B			
6	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
6	AMS		WG	17	lb/100 gal	10-12 leaf	C			

Missing data estimates are included in columns:Average=20,22,23
Could not calculate LSD (% mean diff) for columns 11,18 because error mean square = 0.

Sugarbeet tolerance and weed control from postemergence applications of Ultra Blazer
Trial ID: SB03-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Pest Code									
Crop Code							BETVU	BETVU	BETVU
Rating Date							Sep-18-2018	Sep-18-2018	Sep-18-2018
Rating Type							yield	RWST	RWSA
Rating Unit							ton/acre	#/ton	#/acre
Trt-Eval Interval							148 DA-A	118 DA-A	118 DA-A
Number of Decimals							1	0	0
Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code		
7	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	24.9	207	5159
7	AMS		WG	17	lb/100 gal	2 leaf	A			
7	Ultra Blazer	2	L	24	fl oz/a	4-6 leaf	B			
7	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
7	AMS		WG	17	lb/100 gal	4-6 leaf	B			
7	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
7	AMS		WG	17	lb/100 gal	10-12 leaf	C			
8	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	21.6	216	4664
8	AMS		WG	17	lb/100 gal	2 leaf	A			
8	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
8	AMS		WG	17	lb/100 gal	4-6 leaf	B			
8	Ultra Blazer	2	L	24	fl oz/a	10-12 leaf	C			
8	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
8	AMS		WG	17	lb/100 gal	10-12 leaf	C			
9	Ultra Blazer	2	L	24	fl oz/a	2 leaf	A	23.2	216	5015
9	Ethotron	4	L	12	fl oz/a	2 leaf	A			
9	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A			
9	AMS		WG	17	lb/100 gal	2 leaf	A			
9	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
9	AMS		WG	17	lb/100 gal	4-6 leaf	B			
9	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
9	AMS		WG	17	lb/100 gal	10-12 leaf	C			
10	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	24.0	219	5270
10	AMS		WG	17	lb/100 gal	2 leaf	A			
10	Ultra Blazer	2	L	24	fl oz/a	4-6 leaf	B			
10	Ethotron	4	L	12	fl oz/a	4-6 leaf	B			
10	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
10	AMS		WG	17	lb/100 gal	4-6 leaf	B			
10	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
10	AMS		WG	17	lb/100 gal	10-12 leaf	C			
11	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A	21.6	206	4440
11	AMS		WG	17	lb/100 gal	2 leaf	A			
11	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
11	AMS		WG	17	lb/100 gal	4-6 leaf	B			
11	Ultra Blazer	2	L	24	fl oz/a	10-12 leaf	C			
11	Ethotron	4	L	12	fl oz/a	10-12 leaf	C			
11	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
11	AMS		WG	17	lb/100 gal	10-12 leaf	C			

Missing data estimates are included in columns:Average=20,22,23
Could not calculate LSD (% mean diff) for columns 11,18 because error mean square = 0.

Sugarbeet tolerance and weed control from postemergence applications of Ultra Blazer
Trial ID: SB03-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	Appl Code			
Pest Code										
Crop Code								BETVU	BETVU	BETVU
Rating Date								Sep-18-2018	Sep-18-2018	Sep-18-2018
Rating Type								yield	RWST	RWSA
Rating Unit								ton/acre	#/ton	#/acre
Trt-Eval Interval								148 DA-A	118 DA-A	118 DA-A
Number of Decimals								1	0	0
12	Ethotron	4	L	12	fl oz/a	2 leaf	A	23.3	222	5259
12	Roundup PowerMax	4.5	SL	22	fl oz/a	2 leaf	A			
12	AMS		WG	17	lb/100 gal	2 leaf	A			
12	Ethotron	4	L	12	fl oz/a	4-6 leaf	B			
12	Roundup PowerMax	4.5	SL	22	fl oz/a	4-6 leaf	B			
12	AMS		WG	17	lb/100 gal	4-6 leaf	B			
12	Ethotron	4	L	12	fl oz/a	10-12 leaf	C			
12	Roundup PowerMax	4.5	SL	22	fl oz/a	10-12 leaf	C			
12	AMS		WG	17	lb/100 gal	10-12 leaf	C			
LSD P=.05								4.41	14.7	1016.5
Standard Deviation								3.07	10.2	705.8
CV								14.51	4.65	15.27

Missing data estimates are included in columns:Average=20,22,23
Could not calculate LSD (% mean diff) for columns 11,18 because error mean square = 0.

MSU Weed Science Research Program

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2

Trial ID: SB04-18 Study Dir.: Sprague, Powell, Stiles
Conducted: SVREC Investigator: Christy Sprague

Planting Date:	Apr-18-2017	**Row Spacing:**	30 IN
Variety:	Hilleshog 9619RR	**No. of Reps:**	4
Population:	4.125 " spacing	**% OM:**	2.6
Soil Type:	CL clay loam	**pH:**	6.9
Plot Size:	10 X 30 FT	**Study Design:**	Randomized Complete Block (RCB)

Tillage/Previous Crops: Conventional tillage
Fertilizer:

Crop and Weed Description

Weed	Code	Common Name	Scientific Name
1			

Crop	Code	Common Name
1	BETVU	Sugarbeet

Application Description

	A	B	C	D	E	F
Application Timing:						
Date Treated:	May-24-2017	Jun-8-2017	Jun-15-2017	Jul-5-2017	Jul-18-2017	Aug-10-2018
Time Treated:	3:15 AM	11:15 AM	11:30 AM	11:00 AM	11:10 AM	2:00 PM
% Cloud Cover:	90	0	10	0	0	90
Air Temp., Unit:	63 F	73 F	80 F	78 F	67 F	80 F
% Relative Humidity:	67	36	47	39	67	41
Wind Speed/Unit/Dir:	11 mph N	1.8 mph SSW	5 mph W	1 mph W	3 mph SW	7 mph S
Soil Temp, Unit:		68 F	82 F	72 F	72 F	75 F
Leaf Moist/Dew Presence (Y/N):	5	5	5	5	5	5
Soil Moist:	3	5	4	5	5	5

Crop Stage at Each Application

	A	B	C	D	E	F
Crop 1 Name:	BETVU	BETVU	BETVU	BETVU	BETVU	BETVU
Height:	1-2 " (1)	4-6 " (4)	4-8 " (6)	8-10 " (9)	10-14 " (12)	13-15 " (14)
Stage:	4 leaf	8 leaf	8-12 lf	10-14 lf	14-18 lf	20 leaf

Weed Stage at Each Application

	A	B	C	D	E	F
Weed 1 Name:						
Height:						
Stage:						

Application Equipment

Appl	Sprayer Type	Ground Speed	Nozzle Type	Nozzle Size	Nozzle Height	Nozzle Spacing	Boom Width	Spray Volume	Carrier	Operation Pressure
A	Cub	3.8 mph	AIXR	11003	22 "	20 "	100 "	19 GPA	WATER	30 PSI
B	CUB	3.8 mph	AIXR	11003	26 "	20 "	100 "	19 GPA	WATER	30 PSI
C	CUB	3.8 mph	AIXR	11003	26 "	20 "	100 "	19 GPA	WATER	30 PSI
D	CUB	3.8 mph	AIXR	11003	26 "	20 "	100 "	19 GPA	WATER	30 PSI
E	CUB	3.8 mph	AIXR	11003	26 "	20 "	100 "	19 GPA	WATER	30 PSI
F	CUB	3.8 mph	AIXR	11003	26 "	20 "	100 "	19 GPA	WATER	30 PSI

Comments:
There was no appearent crop injury to sugarbeet in year one of this experiment. There was shallow spring soil-finishing of the field prior to planting corn and soybean to level out the ground from the previous year's sugarbeet harvest. Corn 'Stine 9316' was planted at 32,000 seeds/A on May 1, 2018. Soybean 'Stine 14RD62' was planted at 150,000 seeds/A on May 16, 2018. Black bean 'Zenith' was planted at 106,000 seeds/A on June 19, 2018. Corn and soybean were kept clean with two applications of Roundup PowerMax at 32 fl oz/A + 17 lb/100 gal of AMS on May 25 and June 19, 2018. Dual Magnum at 1.33 pt/A + Prowl H2O at 1.6 pt/A were applied immediatly after dry bean planting on June 19, 2019. There were no differences in flowering between any of the treatments for all three crops.

Michigan State University

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2
Trial ID: SB04-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage					
	Pest Code										
	Crop Code						ZEAMX	ZEAMX	ZEAMX	ZEAMX	ZEAMX
	Rating Date						May-31-2018	May-31-2018	May-31-2018	May-31-2018	Jun-29-2018
	Rating Type						injury	left count	right count	ave count	injury
	Rating Unit						percent	30' row	30' row	30' row	percent
	Trt-Eval Interval						30 DAP	30 DAP	30 DAP	30 DAP	60 DAP
	Number of Decimals						0	0	0	0	0
1	Soybean										
1	Untreated										
2	Soybean										
2	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
2	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
3	Soybean										
3	Ethofumesate	4	L	128	fl oz/a	June 15					
3	Destiny HC		L	1.5	pt/a	June 15					
4	Soybean										
4	Ethofumesate	4	L	128	fl oz/a	July 15					
4	Destiny HC		L	1.5	pt/a	July 15					
5	Soybean										
5	Ethofumesate	4	L	128	fl oz/a	August 15					
5	Destiny HC		L	1.5	pt/a	August 15					
6	Corn						0	55	57	56	0
6	Untreated										
7	Corn						0	56	55	55	0
7	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
7	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
8	Corn						0	57	57	57	0
8	Ethofumesate	4	L	128	fl oz/a	June 15					
8	Destiny HC		L	1.5	pt/a	June 15					
9	Corn						0	56	58	57	0
9	Ethofumesate	4	L	128	fl oz/a	July 15					
9	Destiny HC		L	1.5	pt/a	July 15					
10	Corn						0	57	56	56	0
10	Ethofumesate	4	L	128	fl oz/a	August 15					
10	Destiny HC		L	1.5	pt/a	August 15					
11	Dry bean - Zenith										
11	Untreated										
12	Dry bean - Zenith										
12	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
12	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
13	Dry bean - Zenith										
13	Ethofumesate	4	L	128	fl oz/a	June 15					
13	Destiny HC		L	1.5	pt/a	June 15					

Could not calculate LSD (% mean diff) for columns 1,5,8,12,15,19 because error mean square = 0.

Michigan State University

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2
Trial ID: SB04-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage					
	Pest Code										
	Crop Code						ZEAMX	ZEAMX	ZEAMX	ZEAMX	ZEAMX
	Rating Date						May-31-2018	May-31-2018	May-31-2018	May-31-2018	Jun-29-2018
	Rating Type						injury	left count	right count	ave count	injury
	Rating Unit						percent	30' row	30' row	30' row	percent
	Trt-Eval Interval						30 DAP	30 DAP	30 DAP	30 DAP	60 DAP
	Number of Decimals						0	0	0	0	0
14	Dry bean - Zenith										
14	Ethofumesate	4	L	128	fl oz/a	July 15					
14	Destiny HC		L	1.5	pt/a	July 15					
15	Dry bean - Zenith										
15	Ethofumesate	4	L	128	fl oz/a	August 15					
15	Destiny HC		L	1.5	pt/a	August 15					
	LSD P=.05						.	5.4	5.1	3.7	.
	Standard Deviation						0.0	3.5	3.3	2.4	0.0
	CV						0.0	6.3	5.82	4.24	0.0

Could not calculate LSD (% mean diff) for columns 1,5,8,12,15,19 because error mean square = 0.

Michigan State University

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2
Trial ID: SB04-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	ZEAMX Oct-16-2018 moisture percent	ZEAMX Oct-16-2018 yield bu/acre at 15% M	GLXMA Jun-15-2018 injury percent 30 DAP	GLXMA Jun-15-2018 left count 30' row 30 DAP	GLXMA Jun-15-2018 right count 30' row 30 DAP
	Number of Decimals						1	0	0	0	0
1	Soybean								0	178	172
1	Untreated										
2	Soybean								0	161	160
2	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
2	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
3	Soybean								0	178	157
3	Ethofumesate	4	L	128	fl oz/a	June 15					
3	Destiny HC		L	1.5	pt/a	June 15					
4	Soybean								0	171	174
4	Ethofumesate	4	L	128	fl oz/a	July 15					
4	Destiny HC		L	1.5	pt/a	July 15					
5	Soybean								0	175	179
5	Ethofumesate	4	L	128	fl oz/a	August 15					
5	Destiny HC		L	1.5	pt/a	August 15					
6	Corn						16.5	205			
6	Untreated										
7	Corn						16.4	198			
7	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
7	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
8	Corn						16.0	212			
8	Ethofumesate	4	L	128	fl oz/a	June 15					
8	Destiny HC		L	1.5	pt/a	June 15					
9	Corn						15.7	212			
9	Ethofumesate	4	L	128	fl oz/a	July 15					
9	Destiny HC		L	1.5	pt/a	July 15					
10	Corn						15.6	215			
10	Ethofumesate	4	L	128	fl oz/a	August 15					
10	Destiny HC		L	1.5	pt/a	August 15					
11	Dry bean - Zenith										
11	Untreated										
12	Dry bean - Zenith										
12	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
12	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
13	Dry bean - Zenith										
13	Ethofumesate	4	L	128	fl oz/a	June 15					
13	Destiny HC		L	1.5	pt/a	June 15					

Could not calculate LSD (% mean diff) for columns 1,5,8,12,15,19 because error mean square = 0.

Michigan State University

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2
Trial ID: SB04-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage					
	Pest Code										
	Crop Code						ZEAMX	ZEAMX	GLXMA	GLXMA	GLXMA
	Rating Date						Oct-16-2018	Oct-16-2018	Jun-15-2018	Jun-15-2018	Jun-15-2018
	Rating Type						moisture	yield	injury	left count	right count
	Rating Unit						percent	bu/acre	percent	30' row	30' row
	Trt-Eval Interval							at 15% M	30 DAP	30 DAP	30 DAP
	Number of Decimals						1	0	0	0	0
14	Dry bean - Zenith										
14	Ethofumesate	4	L	128	fl oz/a	July 15					
14	Destiny HC		L	1.5	pt/a	July 15					
15	Dry bean - Zenith										
15	Ethofumesate	4	L	128	fl oz/a	August 15					
15	Destiny HC		L	1.5	pt/a	August 15					
	LSD P=.05						0.65	17.7	.	21.4	14.4
	Standard Deviation						0.42	11.5	0.0	13.9	9.4
	CV						2.63	5.5	0.0	8.07	5.57

Could not calculate LSD (% mean diff) for columns 1,5,8,12,15,19 because error mean square = 0.

Michigan State University

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2
Trial ID: SB04-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	GLXMA Jun-15-2018 ave count 30' row 30 DAP 0	GLXMA Jul-16-2018 injury percent 60 DAP 0	GLXMA Oct-17-2018 moisture percent 1	GLXMA Oct-17-2018 yield bu/acre at 13% M 1	PHSVX Jul-17-2018 injury percent 30 DAP 0
1	Soybean						175	0	10.9	76.6	
1	Untreated										
2	Soybean						160	0	10.8	76.1	
2	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
2	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
3	Soybean						168	0	10.6	78.7	
3	Ethofumesate	4	L	128	fl oz/a	June 15					
3	Destiny HC		L	1.5	pt/a	June 15					
4	Soybean						173	0	10.8	74.5	
4	Ethofumesate	4	L	128	fl oz/a	July 15					
4	Destiny HC		L	1.5	pt/a	July 15					
5	Soybean						177	0	10.8	76.4	
5	Ethofumesate	4	L	128	fl oz/a	August 15					
5	Destiny HC		L	1.5	pt/a	August 15					
6	Corn										
6	Untreated										
7	Corn										
7	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
7	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
8	Corn										
8	Ethofumesate	4	L	128	fl oz/a	June 15					
8	Destiny HC		L	1.5	pt/a	June 15					
9	Corn										
9	Ethofumesate	4	L	128	fl oz/a	July 15					
9	Destiny HC		L	1.5	pt/a	July 15					
10	Corn										
10	Ethofumesate	4	L	128	fl oz/a	August 15					
10	Destiny HC		L	1.5	pt/a	August 15					
11	Dry bean - Zenith										0
11	Untreated										
12	Dry bean - Zenith										0
12	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
12	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
13	Dry bean - Zenith										0
13	Ethofumesate	4	L	128	fl oz/a	June 15					
13	Destiny HC		L	1.5	pt/a	June 15					

Could not calculate LSD (% mean diff) for columns 1,5,8,12,15,19 because error mean square = 0.

Michigan State University

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2
Trial ID: SB04-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage					
	Pest Code										
	Crop Code						GLXMA	GLXMA	GLXMA	GLXMA	PHSVX
	Rating Date						Jun-15-2018	Jul-16-2018	Oct-17-2018	Oct-17-2018	Jul-17-2018
	Rating Type						ave count	injury	moisture	yield	injury
	Rating Unit						30' row	percent	percent	bu/acre	percent
	Trt-Eval Interval						30 DAP	60 DAP		at 13% M	30 DAP
	Number of Decimals						0	0	1	1	0
14	Dry bean - Zenith										0
14	Ethofumesate	4	L	128	fl oz/a	July 15					
14	Destiny HC		L	1.5	pt/a	July 15					
15	Dry bean - Zenith										0
15	Ethofumesate	4	L	128	fl oz/a	August 15					
15	Destiny HC		L	1.5	pt/a	August 15					
	LSD P=.05						16.9	.	0.29	4.34	.
	Standard Deviation						11.0	0.0	0.19	2.82	0.0
	CV						6.45	0.0	1.77	3.69	0.0

Could not calculate LSD (% mean diff) for columns 1,5,8,12,15,19 because error mean square = 0.

Michigan State University

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2
Trial ID: SB04-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	PHSVX Jul-17-2018 left count 30' row 30 DAP 0	PHSVX Jul-17-2018 right count 30' row 30 DAP 0	PHSVX Jul-17-2018 ave count 30' row 30 DAP 0	PHSVX Aug-14-2018 injury percent 60 DAP 0	PHSVX Oct-17-2018 moisture percent 1
1	Soybean										
1	Untreated										
2	Soybean										
2	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
2	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
3	Soybean										
3	Ethofumesate	4	L	128	fl oz/a	June 15					
3	Destiny HC		L	1.5	pt/a	June 15					
4	Soybean										
4	Ethofumesate	4	L	128	fl oz/a	July 15					
4	Destiny HC		L	1.5	pt/a	July 15					
5	Soybean										
5	Ethofumesate	4	L	128	fl oz/a	August 15					
5	Destiny HC		L	1.5	pt/a	August 15					
6	Corn										
6	Untreated										
7	Corn										
7	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
7	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
8	Corn										
8	Ethofumesate	4	L	128	fl oz/a	June 15					
8	Destiny HC		L	1.5	pt/a	June 15					
9	Corn										
9	Ethofumesate	4	L	128	fl oz/a	July 15					
9	Destiny HC		L	1.5	pt/a	July 15					
10	Corn										
10	Ethofumesate	4	L	128	fl oz/a	August 15					
10	Destiny HC		L	1.5	pt/a	August 15					
11	Dry bean - Zenith						154	159	157	0	15.2
11	Untreated										
12	Dry bean - Zenith						157	159	158	0	15.1
12	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x					
12	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x					
13	Dry bean - Zenith						156	151	153	0	15.0
13	Ethofumesate	4	L	128	fl oz/a	June 15					
13	Destiny HC		L	1.5	pt/a	June 15					

Could not calculate LSD (% mean diff) for columns 1,5,8,12,15,19 because error mean square = 0.

Michigan State University

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2
Trial ID: SB04-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	PHSVX Jul-17-2018 left count 30' row 30 DAP 0	PHSVX Jul-17-2018 right count 30' row 30 DAP 0	PHSVX Jul-17-2018 ave count 30' row 30 DAP 0	PHSVX Aug-14-2018 injury percent 60 DAP 0	PHSVX Oct-17-2018 moisture percent 1
14	Dry bean - Zenith						155	145	150	0	14.9
14	Ethofumesate	4	L	128	fl oz/a	July 15					
14	Destiny HC		L	1.5	pt/a	July 15					
15	Dry bean - Zenith						151	156	153	0	14.9
15	Ethofumesate	4	L	128	fl oz/a	August 15					
15	Destiny HC		L	1.5	pt/a	August 15					
LSD P=.05							9.0	15.3	9.9	.	0.74
Standard Deviation							5.8	9.9	6.4	0.0	0.48
CV							3.78	6.45	4.18	0.0	3.19

Could not calculate LSD (% mean diff) for columns 1,5,8,12,15,19 because error mean square = 0.

Michigan State University

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2
Trial ID: SB04-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Pest Code	
Crop Code	PHSVX
Rating Date	Oct-17-2018
Rating Type	yield
Rating Unit	cwt/acre
Trt-Eval Interval	at 18% M
Number of Decimals	1

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	
1	Soybean						
1	Untreated						
2	Soybean						
2	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x	
2	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x	
3	Soybean						
3	Ethofumesate	4	L	128	fl oz/a	June 15	
3	Destiny HC		L	1.5	pt/a	June 15	
4	Soybean						
4	Ethofumesate	4	L	128	fl oz/a	July 15	
4	Destiny HC		L	1.5	pt/a	July 15	
5	Soybean						
5	Ethofumesate	4	L	128	fl oz/a	August 15	
5	Destiny HC		L	1.5	pt/a	August 15	
6	Corn						
6	Untreated						
7	Corn						
7	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x	
7	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x	
8	Corn						
8	Ethofumesate	4	L	128	fl oz/a	June 15	
8	Destiny HC		L	1.5	pt/a	June 15	
9	Corn						
9	Ethofumesate	4	L	128	fl oz/a	July 15	
9	Destiny HC		L	1.5	pt/a	July 15	
10	Corn						
10	Ethofumesate	4	L	128	fl oz/a	August 15	
10	Destiny HC		L	1.5	pt/a	August 15	
11	Dry bean - Zenith						31.3
11	Untreated						
12	Dry bean - Zenith						30.8
12	Ethofumesate (4-times)	4	L	32	fl oz/a	2 lf+14d -3x	
12	Destiny HC (4-times)		L	1.5	pt/a	2 lf+14d -3x	
13	Dry bean - Zenith						30.9
13	Ethofumesate	4	L	128	fl oz/a	June 15	
13	Destiny HC		L	1.5	pt/a	June 15	

Could not calculate LSD (% mean diff) for columns 1,5,8,12,15,19 because error mean square = 0.

Michigan State University

Rotational crop safety with POST applications of ethofumesate (SB04-17) - Year 2
Trial ID: SB04-18 Location: SVREC
Investigator: Christy Sprague
Study Director: Sprague, Powell, Stiles

Pest Code	
Crop Code	PHSVX
Rating Date	Oct-17-2018
Rating Type	yield
Rating Unit	cwt/acre
Trt-Eval Interval	at 18% M
Number of Decimals	1

Trt No.	Treatment Name	Form Conc	Form Type	Rate	Rate Unit	Growth Stage	
14	Dry bean - Zenith						30.8
14	Ethofumesate	4	L	128	fl oz/a	July 15	
14	Destiny HC		L	1.5	pt/a	July 15	
15	Dry bean - Zenith						31.7
15	Ethofumesate	4	L	128	fl oz/a	August 15	
15	Destiny HC		L	1.5	pt/a	August 15	
LSD P=.05							3.07
Standard Deviation							1.99
CV							6.41

Could not calculate LSD (% mean diff) for columns 1,5,8,12,15,19 because error mean square = 0.

Cercospora Nursery
Michigan Sugar Company
Average of 2 years, 2017 & 2018

Trial Quality: Good
Locations: 2017 - Blumfield East, SVREC
2018 - Blumfield East, SVREC
Plot Size: MSC - 2 Rows X 17.5 ft., 5 reps
SVREC - 2 Rows X 20 ft., 5 reps
Inoculation: Trials are Inoculated

Variety	Avg of 2 Years CLS Rate 0-9	2017 CLS Rate 0-9	2018 CLS Rate 0-9
HIL-9908	3.5	3.5	3.6
HIL-9879NT	3.8	4.0	3.7
B-1703	4.0	3.7	4.4
MA-709	4.1	3.9	4.2
B-1399	4.1	3.8	4.4
C-G675	4.5	4.2	4.9
B-1690	4.7	4.5	4.8
HIL-9865	4.7	4.7	4.7
SX-RR1276	4.7	4.7	4.7
Resistant Check	4.7	4.5	5.0
SX-RR1264	4.8	5.0	4.5
B-12RR2N	4.8	4.7	4.9
C-G752NT	4.9	4.8	4.9
SX-RR1243	4.9	5.0	4.8
B-1606N	4.9	4.9	5.0
C-RR059	4.9	4.9	5.0
SX-RR1275N	5.0	5.0	5.0
SX-RR1278N	5.0	5.0	5.1
SX-RR1245N	5.1	5.3	4.9
C-G515	5.2	4.9	5.4
C-G333NT	5.3	5.3	5.4
Susceptible Check	5.4	5.4	5.3
B-149N	5.4	5.3	5.5
Average	4.72	4.65	4.78

Cercospora Rating (0-9 Scale): 0 = no spots, 1 = very few spots, 2 = up to 10 spots/leaf, 2.5 = up to 50 spots/leaf, 3 = 100 to 200 spots/leaf (approx 3% leaf injury), 4 = up to 10 % injury, 5 = up to 25 % injury, 6 = up to 50% injury, 7 = up to 75% injury, 8 = up to 90% injury, 9 = leaves completely dead.

Comments: These are inoculated trials. Ratings begin when the disease level approaches economic damage. Each trial is rated at least 5 times, until most varieties begin to burn down. Ratings are averaged to provide result.

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan State University AgBioResearch

Sugarbeet Response to Starter Fertilizer, N Rate, and Plant Population

Seth Purucker, Andrew Chomas, and Kurt Steinke, Michigan State University
See soil.msu.edu for more information

Location: Saginaw Valley Research and Extension Center	**Tillage**: Conv., 30-in. row
Planting Date: April 30, 2018 (Harvest 10/18/18)	**Trts:** See below
Soil Type: Clay Loam; 2.1% OM; 8.0 pH; 34 ppm P; 185 ppm K	**Population**: 3 ½ & 4 in. spacing
Variety: Crystal 675	**Replicated**: 4 replications

N Rate and 2x2 Interaction	Tons/A	RWSA	Gross Grower Payment ($/A)	Net Economic Return Minus N Costs ($/A)[a]	Net Economic Return Minus N Costs and Trucking ($/A)[b]
0 N w/ 2x2	23c[†]	6046d	1041d[†]	1041c	955c
0 N w/o 2x2	24c	6310d	1074d	1074c	986c
80 N w/ 2x2	31b	8255b	1416bc	1381ab	1266ab
80 N w/o 2x2	28b	7530c	1292c	1257b	1150b
160 N w/ 2x2	36a	9253a	1590a	1520a	1386a
160 N w/o 2x2	30b	7754bc	1330bc	1260b	1147b
240 N w/ 2x2	34a	8385b	1438b	1333b	1206b
240 N w/o 2x2	34a	8252b	1421b	1316b	1187b
P>F	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**

[†]Column values with the same lower case letter are not significantly different at α=0.10.

[a, b] Gross grower payment and net economic returns based upon $41/ton base payment with volume and quality incentives, an N price of $0.44/lb., and trucking costs of $3.75/T.

Summary: Trial quality was good to very good. Treatments consisted of two populations (3½ and 4 inch spacing which resulted in 50,000 or 60,000 seeds per acre), four N rates (0, 80, 160, 240 lbs. N/A), and 2x2 applied starter fertilizer (with and without). All treatments with starter fertilizer received 40 lbs. N/A as 28%, 20 lbs. P_2O_5/A, 50 lbs. K_2O/A, and 2 lbs. Mn/A applied 2 inches below and two inches to the side of the seed. Treatments at the 0 lbs. N/A rate did not receive any N in starter application only P, K, and Mn. Starter N was subtracted from sidedress N application rates. Sidedress N applications were completed at the 2-4 leaf stage on May 30 using 28% UAN.

An interaction between N rate and starter fertilizer significantly affected yield, RWSA, gross grower payment, and net economic returns. A total N rate of 160 lb. N/A (40 N 2x2 with 120 N sidedress) resulted in the best combination of tonnage, quality, and profitability. When starter N was not utilized, an additional 80 lb N/A were required to achieve maximum yield. Plant

population resulted in few difference in sugar quality. Overall N rate significantly affected RWST and % sugar with no improvements over 80 lb. N/A. Wet soil conditions from increased August and September rainfall likely decreased overall sugar contents.

Treatment	RWST	% Sugar	% CJP
Population, seeds A^{-1}			
50,000	258 a†	17.2 a	96.3 a
60,000	260 a	17.4 a	96.3 a
P>F	**NS**	**NS**	**NS**
N Rate, lbs. N A^{-1}			
0	266 a	17.7 ab	96.3 a
80	267 a	17.8 a	96.4 a
160	259 b	17.3 b	96.3 a
240	245 c	16.5 c	96.1 a
P>F	**<0.01**	**<0.01**	**NS**
Starter Fertilizer			
2x2	260 a	17.3 a	96.3 a
No 2x2	258 a	17.2 a	96.4 a
P>F	**NS**	**NS**	**NS**

†Column values with the same lower case letter are not significantly different at α=0.10.

Gross grower payment was maximized at 160 lbs. N/A with 2x2 application. However net economic return was maximized at 80 lbs. N/A with 2x2 application. Growers often perceive yield loss as a greater risk than profitability. However, greater tonnage and payment may not offset input costs and greater input intensities may impact disease development. Starter (2x2) applied N may provide opportunities to increase N efficiency, decrease overall N rates, and help address mid-season variable weather patterns. Trial will be repeated in 2019.

Does Sugarbeet Row Spacing Affect the Need for Starter Nitrogen?

Kurt Steinke[1], Brian Groulx[2], Seth Purucker[1], and Andrew Chomas[1]
[1] Michigan State University and [2] Michigan Sugar Company
See soil.msu.edu for more information

Location: Saginaw Valley Research and Extension Center	**Tillage**: Conv.
Planting Date: April 30, 2018 (Harvest 09/27/18)	**Trts:** See below
Soil Type: Clay Loam; 2.1 OM; 8.0 pH; 34 ppm P; 185 ppm K	**Population**: 4 in. spacing
Variety: Crystal 675	**Replicated**: 4 replications

Row spacing	RWSA	RWST	Tons/A	% Sugar	% CJP
22 inch	5725	232	26	16.1	95.2
30 inch	6697	245	27	16.8	95.9
$LSD_{(0.10)}$[a]	**NS**	**9**	**NS**	**0.5**	**0.23**

[a] LSD, least significant difference between means within a column at ($\alpha = 0.10$).

Summary: Study was undertaken to help determine whether row spacing impacted the need for starter N applied 2x2 at planting. Four treatments were evaluated in a split-plot design and included: 1) 22 inch rows with 40 lbs. N/A 2x2 and 120 N sidedressed (2-4 lf), 2) 22 inch rows with 40 lbs. N/A applied PRE and 120 N sidedressed (2-4 lf), 3) 30 inch rows with 40 lbs. N/A 2x2 and 120 N sidedressed (2-4 lf), and 4) 30 inch rows with 40 lbs. N/A applied PRE and 120 N sidedressed (2-4 lf). Treatments with 2x2 received 40 lbs. N/A using UAN 28% two inches below and two inches to the side of the seed at planting. Treatments with N applied PRE received 40 lbs. N/A using urea with a urease inhibitor broadcast applied immediately following planting. Sidedress N applications were completed at the 2-4 leaf stage on May 30 for a total N application rate of 160 lb./A.

Due to no interaction between row spacing and starter N, only main effects of row spacing on sugar yield and quality are displayed as starter N did not impact these parameters. No differences in tonnage or RWSA were observed due to row spacing. However, percent sugar, purity, and RWST were significantly greater with 30 inch as compared to 22 inch rows. June through July precipitation was 36% below 30-year means indicating dry soil conditions likely limited N movement and plant growth following both 2x2 and sidedress N applications. Starter N applied 2x2 did achieve row closure 10-14 days sooner compared to no starter N applications. Row closure was achieved 7-10 days earlier in 22 inch rows as compared to 30 inch rows but did not translate into greater sugar production. Starter N can offer stand consistency across variable spring and summer weather conditions but did not result in a measureable yield response in 2018. Trial will be repeated in 2019.

MSU Wheat Breeding and Genetics 2018 Report

Eric Olson, *Wheat Breeder and project PI*
Dennis Pennington *Research Assistant*
Sam Martin, *Research Assistant*
Amanda Noble, *Research Assistant*
Jon Turkus, *Graduate student researcher*

Introduction

The counties of the thumb region have the highest yields in the state and account for up to 35% of all wheat bushels produced in Michigan. To observe high-end yield potential and target the largest production area of the state, MSU Wheat Breeding and Genetics conducts early generation selection and yield testing at the Saginaw Valley Research and Extension Center near Richville, MI.

Four large yield testing and breeding projects were conducted at SVREC in 2018. As part of the variety development program, advanced yield trials (AYT), preliminary yield trials (PYT) and the Uniform Eastern Soft White Winter Wheat Nursery were tested in order to target new high yielding varieties to the thumb region of Michigan. Single plant selections were made in over 500 early generation F_4 bulk plots.

Advanced Yield Trials

Plant Materials

A total of 100 new soft red and white winter wheat lines were entered into advanced testing at SVREC in 2017. Soft white winter wheat check varieties were Ambassador and Dyna-Gro 9242. Soft red winter wheat check varieties were DF 112R and Pioneer 25R40.

Trial Design

Entries and checks were tested in two replicates in an alpha lattice design. In addition to SVREC, the advanced yield trial was tested in Allegan, Huron, Lenawee, and Sanilac counties.

Results and Discussion

Grain yield was lower in 2018 than previous year due to extreme conditions throughout the growing season. Early season moisture was ideal for establishing good stands and trials were on track for good yield potential. Low rainfall and very high temperatures in June and July reduced yield significantly. The average grain yield of the wheat breeding advanced yield trial was 12 bushels lower than 2016 but similar to the 2017 average. The Tuscola county yield trial located near the SVREC station experienced a 25 bushel decrease relative to the average due to the extremely dry and hot conditions.

A total of eight soft winter wheat lines have been advanced to further testing in the Michigan State Wheat Performance Trial using data collected from five locations including SVREC (Table 1). The soft white winter line MI16W0528 yielded significantly higher than the adapted check variety Ambassador and was the highest yielding breeding line overall.

Preliminary Yield Trials

Plant Materials

Preliminary yield trials were comprised of 800 new soft red and soft white winter wheat entries and the check varieties Ambassador and Pioneer 25R40 (Table 1). Preliminary yield trials were comprised of 1000 new soft red and soft white winter wheat entries and the check varieties Ambassador and Pioneer 25R40 (Table 2).

Trial Design

An augmented design was used where new entries were planted in single replicates. Check varieties were replicated across blocks to account for field variation. Effects of individual blocks were determined and yield values of experimental lines were adjusted accordingly. Ambassador was replicated four times in each block. The Pioneer 25R40 check was planted randomly across the field.

Multiple statistical models were implemented for autospatial correction of field variation. A random effects model was used to account for variation due to effects of range, pass and blocks $y_{ijk} = \mu + g_i + r_j + p_j + error_{ij}$, where g_i is the random effect of the i^{th} genotype, e_j is the random effect of the j^{th} range, and p_j is the random effect of the j^{th} pass. BLUPs weare estimated for all entries and checks and the random effect of genotype. The R package SpATS (Spatial Analysis of Field Trials with Splines) which models spatial variation along the row by column matrix. Field variation is modeled and specific plot values are adjusted up or down depending on the specific row by column position. A mixed model was also implemented in ASREML-R v 3.0 to account for field variation in preliminary yield trials. The autoregressive 1 (AR1) model was implemented to identify correlation and covariance between adjacent plots across the field.

Results and Discussion

Yields across the field were fairly uniform. However, the three models used to calculate yields differed slightly in their predictions. A selection index that integrated all three models as well as data from the Mason location were used to advance lines. From the PYT, 100 entries are being tested in replicated trials at six locations in 2019.

Uniform Eastern Soft White Winter Wheat Nursery

Plant Materials

The UESWWWN is comprised of soft white winter wheat entries from Michigan State University (MI entries), Cornell University (NY entries) and KWS Cereals. In 2018, the UESWWWN was comprised of 15 entries and five check varieties (Table 2). Lines from the UESWWWN are yield tested at SVREC and evaluated for FHB resistance traits in the misted and inoculated nursery on the MSU campus.

Results and Discussion

SVREC provided critical data for the Uniform White nursery cooperators. The soft white winter wheat from MSU, MI14W1046, was the highest yielding line overall. MI15W0193 was found to have high yield and excellent resistance to FHB. The 2019 variety release, MI14W1039 had very competitive yield and flowered at least one day earlier than the check varieties, which provides a unique market niche for this variety.

Early Generation Selection

Plant Materials

A total of 526 unique breeding populations were planted for single plant selection at SVREC. Each population consisted of 280 F_4 plants. Each population was planted in one 35 foot plot comprised of four rows. Individual seed were space-planted at 6 inches providing good separation of individual plants for selection. Selection of individual plants was made when approximately half of all plants were flowering. Across all populations, stringent phenotyping selection for early flowering and plant type was made on ~155,000 plants.

Results and Discussion

Across all populations, 1,500 single plants were selected and harvested. Specific pedigrees and parents were selected at a higher frequency. The pedigree VA05W-139/U6369R7-11-1A11-1RKYB had 20 plants selected. Pedigrees with the MSU soft red winter wheat parent F0036R and the exotic breeding germplasm U6369R7 were also selected at high frequency. All selected lines were genetoyped at 384 plex using genotyping by sequencing and have been planted in headrows at Mason for seed increase. A combination of genomic selection and phenotypic selection will be used to advance lines into 2019-20 yield testing.

Acknowledgements

MSU Wheat Breeding and Genetics is supported by The Michigan Wheat Program, Michigan Crop Improvement Association, companies of the Michigan Millers Association, Project GREEEN, The US Wheat and Barley Scab Initiative and USDA-National Institute of Food and Agriculture.

Table 1. Yield performance soft red and white winter wheat entries and check varieties in the MSU Wheat Breeding and Genetics advanced yield trial.

Line	Pedigree	Color	Overall Yield	*Overall Rank*	SVREC Yield	*SVREC Rank*	FHB Index
MI16W0528	E6012//Kingbird/Jupiter	White	87.1	*1*	75.7	*22*	37.7
Whitetail	Ambassador/Jupiter	White	85.7	*3*	77.3	*11*	45.7
MI16W0133	Jupiter/E2041	White	85.1	*5*	70.8	*52*	67.4
Jupiter	-	White	84.4	*9*	83.6	*2*	63.3
MI16W0149	Jupiter/E6032	White	83.3	*11*	78.1	*8*	44.6
MI16W0522	E6012//E0009/E5024	White	83.2	*12*	75.1	*26*	22.4
Ambassador	-	White	82.2	*22*	76.2	*17*	65.5
AM 413	-	Red	86.4	*2*	76.4	*16*	43.6
DF 112 R	-	Red	85.4	*4*	81.4	*5*	57.6
SY 100	-	Red	85.0	*6*	75.2	*25*	41.0
Pioneer 25R40	-	Red	84.6	*7*	83	*3*	44.3
MI16R0592	Ambassador/Shirley	Red	84.5	*8*	78.3	*7*	50.6
MI16R0898	Jupiter//RedRuby/KY02C-3005-25	Red	83.8	*10*	71.8	*45*	28.1
MI16R1172	Crystal//25R47/P.0537A1-7-12	Red	82.8	*14*	75.3	*24*	12.8
Mean			***78.7***		***72***		***36.0***
LSD (0.05)			***2.8***		***5.4***		***-***

Figure 1. Spatial variation in grain yield data in the preliminary yield trial at SVREC. The Raw data plots the grain yield of specific plots based on their row and column matrix position. Using SpATS, the spatial trend in yield variation can be identified and specific plot values are adjusted. The Fitted Spatial Trend shows extent of yield adjustment for each plot. Areas in blue are higher yielding and are therefore more greatly penalized.

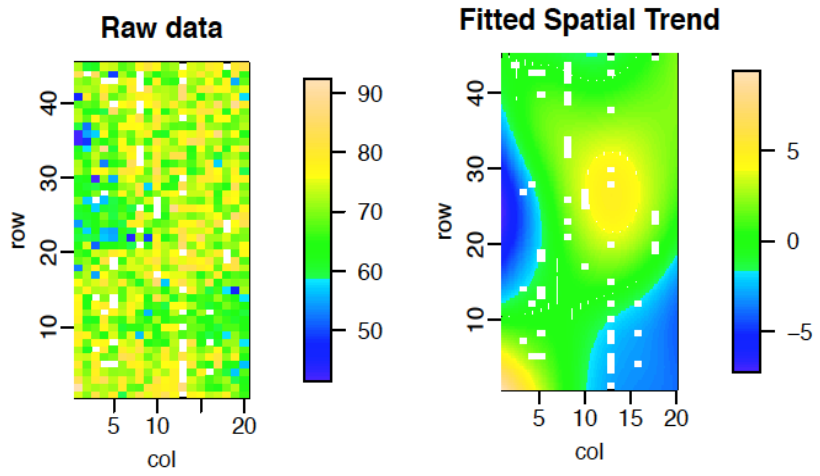

Table 2. Results from the 2018 Uniform Eastern Soft White Winter Wheat Nursery

Line	Pedigree	*Yield Rank*	Yield bu/ac	Test Weight	Height in.	JDF	FHB index 0-100
MI14W1046	D6234 /3/ E6003 // FHB 12 / Ambassador	*1*	82.2	57.1	33.0	150.0	48.5
Ambassador	P2737W/D1148	*2*	81.1	57.4	34.0	150.5	64.1
DG 9242W	-	*3*	80.6	59.0	33.5	151.0	25.8
MI15W0193	E0009 / E5024	*4*	80.1	56.4	33.0	148.0	24.8
MI14W0906	MISC HDS-148 / VA03W-412	*5*	78.0	57.9	33.5	149.5	54.5
MI14W1039	Ambassador / D6234	*6*	77.9	57.2	33.0	148.0	44.0
MI15W0461	E5011B / D6234	*7*	76.7	58.8	33.5	148.0	56.3
Jupiter	Caledonia / NY88024-117	*8*	76.2	56.8	31.5	150.5	62.0
NY99069-249	Harus x P89204A8-1-59	*9*	75.6	57.5	30.5	150.0	64.0
NY99056-161	NY85020-395/Pio25W33 (10+6)	*10*	75.0	56.6	33.5	151.0	7.1
Venus	-	*11*	74.2	56.2	34.0	147.0	48.5
Whitetail	Ambassador/Jupiter	*12*	73.9	56.4	30.5	148.0	51.0
NY07078-876	Pio25W41 x NY88046-8138	*13*	72.8	56.5	33.0	150.0	37.8
MI14W0901	MISC HDS-148 / VA03W-412	*14*	72.3	58.8	31.5	147.0	75.2
Caledonia	Offtype selection out of Geneva (Cornell)	*15*	70.8	56.4	31.0	146.5	72.3
MI14W0742	UNKNOWN	*16*	70.6	55.9	32.0	150.0	64.0
Cayuga	Reselection of NY262-37-10W	*17*	70.0	59.7	40.5	150.0	15.5
KWS249	W07-03wa/W07-999a(D6234/P2552)	*18*	68.5	57.7	31.5	149.5	31.1
KWS250	X08-10W/W07-03wa	*19*	68.2	59.4	31.5	149.5	12.9
NY10127-10-62-1308	NY09099-26 x NY09090-2	*20*	62.2	55.8	31.0	151.0	45.5
MEANS:			74.3	57.4	32.8	149.2	45.1
LSD (0.05)			5.1	0.6	2.0	1.4	30.1