2015 RESEARCH REPORT

SAGINAW VALLEY

RESEARCH & EXTENSION CENTER

MICHIGAN STATE UNIVERSITY

Ag**B**io**RESEARCH**

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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 then purchased and operates a 320 acre farm near Richville Michigan in Denmark Township. The site is being established as an AgBioResearch research center. Natural gas has been hooked up and the Educational Center will be completed in 2016 which will complete the current infrastructure improvements. 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 2015 season was the seventh season of research at the site. This research report is primarily a compilation of research conducted at the site in 2015. 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.

Weather – The monthly rainfall for 2015 collected with the automated rain gauge is given in Table 1. The monthly totals are given at the bottom of the table. Rainfall was average to above average through the growing season. Planting in the spring was timely but dry bean planting was delayed due to rain. The rainfall total of 28.49" was average. Maximum and minimum daily temperatures along with growing degree days (base 50^0F) are given in Table 2. The 2015 season was average with 2 days above 90 degrees and 22 days above 85 degrees. The growing degree days for 2015 was 2324 which was below the 5 year average but close to the long term average. The average yields for crops grown on the farm was: corn at 200 bushels/acre, soybeans at 60 bushels/acre, dry beans at 25 cwt/acre, and sugarbeets at 35 tons/acre.

GROWING DEGREE DAYS - SAGINAW VALLEY RESEARCH FARM

Base 50 (max + min / 2 - 50)

	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	TOTAL
1979	47.50	228.50	458.50	577.50	479.00	330.00	116.00	2237.00
1980	34.00	281.50	369.00	617.50	606.00	317.50	33.50	2259.00
1981	55.50	187.00	491.00	579.50	312.00	265.00	13.50	1903.50
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
AVERAGE	63.88	246.34	488.03	623.61	554.34	325.07	95.07	2396.32

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

MAXIMUM-MINIMUM AIR TEMPERATURES (F)
SAGINAW VALLEY RESEARCH & EXTENSION CENTER - 2015

	JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE	
DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	28	18	25	13	25	7	58	25	72	36	62	38
2	31	18	15	2	28	12	63	40	75	43	70	37
3	32	21	22	2	32	19	51	29	80	48	75	43
4	32	13	23	-1	28	5	48	20	74	51	80	49
5	13	0	13	-9	15	-5	43	31	60	45	72	59
6	14	6	26	12	22	-2	56	29	75	42	68	44
7	11	2	33	23	36	18	49	33	86	51	77	44
8	11	2	32	18	38	19	41	33	83	59	81	60
9	12	0	19	0	44	22	60	35	69	56	77	57
10	14	0	27	-1	46	30	63	37	57	45	86	59
11	30	13	31	16			59	32	68	45	75	53
12	26	5	20	-4			68	33	61	45	63	54
13	17	-1	18	-10			64	46	58	37	68	54
14	18	-9	19	-6			66	33	66	35	79	62
15	29	13	1	-14			63	31	69	49	82	67
16	30	9	11	-15			62	33	75	51	78	58
17	40	14	20	2			75	43	83	59	78	52
18	38	31	12	-4			63	38	83	61	80	61
19	31	24	1	-15			66	32	61	40	70	52
20	28	22	10	-20	52	27	61	41	58	36	79	47
21	24	8	25	10	44	23	46	36	69	41	83	62
22	28	8	22	-5	35	14	38	30	66	39	81	56
23	31	13	8	-16	31	17	39	28	76	32	75	59
24	35	25	22	1	41	12	54	23	79	47	81	49
25	31	14	19	-2	45	26	54	31	81	62	78	58
26	24	5	12	-6	39	25	57	28	83	64	78	54
27	24	6	16	-13	26	14	53	35	79	58	66	59
28	31	6	21	0	34	13	61	30	82	53	77	58
29	30	21					67	34	84	59	79	57
30	22	9					60	40		49	75	54
31	30	10			46	31			52	41		

MAXIMUM-MINIMUM AIR TEMPERATURES (F)
SAGINAW VALLEY RESEARCH & EXTENSION CENTER - 2015 cont.

	JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	66	56	81	55	85	38	59	38	59	40	45	32
2	73	50	86	57	86	40	59	40	71	37	41	27
3	75	43	78	60	79	44	50	44	74	45	41	29
4	81	50	77	54	77	44	55	44	74	45	47	34
5	83	57	75	54	81	52	63	52	72	54	43	27
6	85	55	76	53	86	51	63	51	66	45	44	25
7	75	56	78	51	86	44	68	44	50	32	38	27
8			75	62	84	36	68	36	50	27	42	30
9	76	55	83	60	73	41	63	41	56	28	48	31
10	81	55	74	63	74	34	63	34	49	31	56	31
11	83	56	79	60	63	48	75	48	58	32	48	33
12	83	64	76	55	62	55	71	55	52	43	47	30
13	79	60	82	58	65	47	61	47	44	33	60	43
14	76	62	86	62	75	42	56	42	47	32	60	45
15	71	50	86	59	83	42	65	42	62	38	46	36
16	78	45	86	65	82	35	49	35	66	37	47	35
17	85	62	86	68	81	55	47	28	61	40	43	30
18	86	64	84	65	81	61	49	27	61	56	32	22
19	85	63	84	70	70	49	68	30	59	37	29	20
20	85	59	72	59	69	43	67	54	43	30	44	19
21	79	58	75	54	73	44	67	53	34	26	46	38
22	78	56	80	56	76	45	64	40	27	9	46	35
23	84	50	79	54	79	46	55	30	31	21	59	34
24	87	55	70	52	77	49	68	49	39	26	58	37
25	86	63	63	52	79	52	59	36	52	28	45	26
26	88	61	65	55	75	52	57	31	57	45	38	24
27	90	57	67	52	77	55	57	37	58	31	37	28
28	92	62	73	48	78	60	60	46	34	22	32	23
29	89	62	69	59	69	53	51	37	37	18	38	31
30	83	61	79	61	62	40	51	37	42	21	33	30
31	84	61	78	58			49	39			30	28

MONTHLY PRECIPITATION, SAGINAW VALLEY RESEARCH FARM

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1983	0.89	0.90	3.29	4.55	6.15	3.55	1.91	2.50	5.11	2.95	3.06	2.00	36.86
1984	0.56	0.73	3.18	3.20	3.66	3.94	2.42	3.75	3.29	3.05	2.67	2.18	32.63
1985	1.85	2.12	4.08	3.96	2.30	1.87	2.38	7.02	4.38	3.08	4.66	1.05	38.75
1986	1.34	2.24	1.62	1.87	3.10	3.48	1.38	2.76	18.05	2.64	0.75	1.38	40.61
1987	1.11	0.82	1.03	2.03	0.67	4.11	1.35	3.92	5.03	1.88	2.13	2.63	26.71
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
AVG.	1.21	1.12	1.50	2.87	2.93	2.74	2.41	3.10	3.07	2.56	2.38	1.33	27.21

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

PRECIPITATION - SAGINAW VALLEY RESEARCH & EXTENSION CENTER- 2015

Day:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1							0.04	0.04				0.02
2				0.03				1.45				
3	0.36							0.01	0.96	0.03		
4	0.15		0.06		0.09					0.17		
5				0.19	0.01							
6										0.01	0.19	
7		0.03		0.01			0.40		0.02			0.01
8				0.69	0.1	0.88		0.03	0.61	0.21		
9		0.05		0.49	0.05	0.02			0.05	0.01		
10				0.09	0.12			0.47			0.11	
11					0.28							
12						0.73			0.09		0.18	
13				0.04			0.02	0.03			0.01	0.18
14						0.5	0.30	0.70				0.11
15					0.16	0.32		0.01				0.01
16						0.02						0.02
17							0.36					0.01
18							0.01		0.34		0.01	
19	0.01			0.17				0.30	0.55			
20				0.25				0.13				
21										0.04		0.39
22	0.05					0.19						0.06
23								0.52				0.12
24										0.49	0.11	
25					0.09							
26			0.24		0.21		0.01				0.21	0.24
27				0.01		0.02	0.01				0.43	0.09
28										0.58		
29	0.02				0.58			0.25		0.07		0.77
30					1.03		1.05				0.01	0.01
31			0.26		0.14					0.35		
TOTAL	0.59	0.08	0.56	1.97	2.86	2.68	2.20	3.94	2.62	1.96	1.26	2.04

Rainfall is measured in inches

2015 YEAR END TOTAL: 22.76 INCHES

Sugar beet activities of the USDA-ARS East Lansing conducted in cooperation with Saginaw Research & Extension Center during 2015

Mitch McGrath, Linda Hanson, and Tom Goodwill
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Evaluation and rating plots were planted at the Saginaw Valley Research & Extension Center (SVREC) in Frankenmuth, MI in 2015 that focused 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 April 30, 2015, the BSDF CRR evaluation nursery was planted on May 1, 2015, and the other evaluation and breeding nurseries on May 6. A randomized complete-block design with one to five replications was used, depending on the specific test. All plots were 15 ft long, with 30 in between rows with the exception of the BSDF CLS nursery, which was planted on 20 in rows. Most entries were commercial or near-commercial varieties, and weeds were controlled with glyphosate at the recommended rates. For non-commercial entries, weeds were controlled with three applications of mixtures of phenmedipham, desmedipham, triflusulfuron methyl, and clopyralid and one application of S-metolachlor. Hand weeding was done as needed to control larger weeds. The BSDF trails 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 control Rhizoctonia damping-off.

The BSDF cooperative CRR Eastern Evaluation Nursery, a recent addition to the SVREC whose activities are complemented by the Western Nursery at Kimberly, Idaho, had entries from four companies, with a total of 249 entries 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 June 24 with a dry ground barley inoculum of *Rhizoctonia solani*, anastomosis group 2-2 (highly virulent isolate) at 0.96 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 were dug August 17, 18, and 19 (three weeks earlier than 2014) with a modified single row harvester. 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 entire nursery ranged from 3.8 to 6.0 (mean = 5.4), with the percent of roots classified as “harvestable” (less than 25% of the root rotted) ranging from 0% to 43% for the different varieties.

The official BSDF cooperative CLS evaluation nursery had entries from three companies, with a total of 222 entries evaluated. This nursery was 2-row, 4 replications conducted in a double-blind fashion. 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 2014 inoculated leaf spot nursery at SVREC. 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 by early September, after which regrowth started to outpace new disease development. Variety means for the commercial nursery were 1.2 on Aug 8 (range = 1 to 2), Aug 13 mean = 2.7 (range = 1 to 4), Aug 20 mean = 4.1 (range 1 to 7), Aug 27 mean = 4.9 (range = 2 to 7), and Sept 3 mean = 5.7 (range = 3 to 8).

In addition to commercial entries, 224 USDA-ARS breeding lines and checks from three USDA cooperators (Fargo, ND, Ft. Collins, CO, East Lansing, MI) were evaluated on three dates; Aug 13, Aug 27, and Sept 9. Fargo entry ratings (24 entries) ranged from 3 to 8 (mean 6.1, standard deviation 1.2) on the last rating. Kimberly entries (14 entries) mean rating was 5.0 (standard deviation 1.2, ranging from 3 to 8) on the same date. Fort Collins' (57 entries) ratings ranged from 3 to 8, with a mean of 5.3 (std, dev. 1.2). East Lansing (94 entries) scores ranged from 3 to 7, with a mean of 4.7 (std. dev. 0.8).

For all CLS nurseries, High Definition videos of disease development were taken throughout the season, roughly twice per week depending on weather. Software was developed to test whether the image analyses would be useful, with promising results. One problem encountered was a reliable method to register test plots with captured images and this problem was partially solved using RTK-GPS data captured along with video, however mapping varieties to GPS coordinates (without geo-referencing) still proves to be problematic. A visiting scientist has begun to solve this issue, and further develop the CLS rating model.

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following production of seed stalks and others were showing new leaf growth following defoliation from Cercospora leaf spot, so these ratings were not used. Weeds were controlled by a preplant application of ethofumesate 7 May, three times with mixtures of phenmedipham, desmedipham, triflusulfuron methyl, and clopyralid (23 May and 11, and 24 Jun) and once with S-metolachlor (17 Jun). Hand weeding was done as needed to control larger weeds. The beet crop was thinned by hand with the generous help of Michigan Sugar Cooperative. Bolting beets were removed throughout the season.

The moderate night temperatures in the summer of 2015, combined with high humidity and rainfall, contributed to a moderate leaf spot epiphytotic. Supplemental moisture was applied using an overhead irrigation system 3, 6 and 10 Jul. The BeetCast leafspot advisory in the Frankenmuth area from 1 May to 20 Sep accumulated 224 daily severity values. Disease severity peaked by early Sep, after which regrowth started to outpace new disease development, so that disease ratings for several accessions remained constant or decreased after that rating, thus ratings were not given after this date (Table 1). At the 9 Sep 15 rating, means of the resistant and susceptible internal controls for the entire nursery (including two additional experiments) were 3.2 and 7.0, respectively, across the nursery. At the peak of the epiphytotic in 2014 (3 Sep), these means were 2.4 and 5.8 for resistant and susceptible checks, respectively. Means of contributor lines in the entire nursery (including three additional tests) in 2015 ranged from 2.7 to 7.0. An analysis of variance (PROC GLM - SAS) on the disease indices (visual evaluation scores) determined that there were significant differences among entries ($p \leq 0.05$) on all dates of evaluation. All accessions were significantly different from the resistant control at the final four rating dates, but three accessions, PIs 506218, 515965, and 518167, as well as the East Lansing breeding materials EL- A027162 and EL-A029709 were not significantly different from the resistant control at the first rating date. At the final rating date, near the peak of the epiphytototic, eleven accessions (in order from lowest to highest disease severity rating: PI 518167, PI 538250, PI506238, PI 518314, NSL 176410, NSL183446, PI296541, NSL28041, NSL183461, PI357367, and PI505828) and the East Lansing breeding lines were significantly different from the susceptible control. Only two accessions (NSL34020 and PI518314) required removal of seed stalks from at least one replicate during the season while five of the crosses from previous years PIs required such removal (735, 779, 780, 791, and 795). These data, and more information on the accessions evaluated, are available through the USDA-ARS GRIN database at http://www.ars-grin.gov/npgs." (The preceding was extracted from a submission to Plant Disease Management Reports (www.plantmanagementnetwork.org/pub/trial/pdmr/)).

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	Identification			Average disease index[z]				
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NSL28041	B236	*vulgaris*	United States	2.7	3.0	3.7	4.7	5.7
NSL28073	A 0034	*vulgaris*	United States	2.7	4.0	5.0	6.0	6.7
NSL34020	A 1491	*vulgaris*	United States	4.0	5.6	6.3	7.3	7.3
NSL86577	72/2-4-2-0	*vulgaris*	United States	3.0	4.3	5.0	6.0	6.7
NSL141986	CS 42	*vulgaris*	United States	3.3	4.3	5.3	6.3	7.0
NSL142025	R&G Pioneer	*vulgaris*	United States	3.3	4.7	6.3	7.0	7.0
NSL176410	Yugo 5	*vulgaris*	Former Serbia&Mont	3.0	4.0	4.3	5.0	4.7
NSL183376	342	*vulgaris*	United States	3.0	4.3	5.3	6.0	7.0
NSL183409	1332	*vulgaris*	United States	2.7	4.0	5.0	6.0	7.0
NSL183444	4326	*vulgaris*	United States	2.7	430	4.7	5.7	6.3
NSL183446	5090	*vulgaris*	United States	2.3	3.3	4.0	5.0	5.3
NSL183461	7411	*vulgaris*	United States	3.0	3.7	4.3	5.0	6.0
PI 169024	Kirmizi	*vulgaris*	Turkey	3.0	5.0	6.7	7.0	7.3
PI 296541	Tetra-Tri-Polanowice	*vulgaris*	Poland	2.0	3.7	4.0	4.3	5.7
PI 357367	Sveklo	*vulgaris*	Macedonia	3.0	4.0	4.3	5.0	6.0
Pl 372276	300/71	*vulgaris*	Poland	2.7	43	5.0	6.0	6.7
PI 372278	Mono-IHAR	*vulgaris*	Poland	2.7	3.7	4.3	5.3	6.3
PI 381644	Ramonskij 23	*vulgaris*	Former Soviet Union	2.7	4.0	5.0	6.0	7.0
PI 470091	IDBBNR 5522	*vulgaris*	United Kingdom	3.0	4.3	5.3	67	7.0
PI 505826	Belocerkovskij Poligibrid 34	*vulgaris*	Former Soviet Union	3.3	4.0	5.0	6.0	7.0
PI 505828	Ganusovskij Poligibrid 8	*vulgaris*	Former Soviet Union	2.3	3.7	4.3	5.7	6.0
PI 506238	FC707(4x)	*vulgaris*	United States	1.7	3.0	3.0	4.0	4.7
PI 507848	IDBBNR 5565	*vulgaris*	Hungary	3.0	4.3	6.0	7.3	7.3
PI 515964	C790	*vulgaris*	United States	2.7	4.0	5.0	6.0	6.7
PI 515965	C796	*vulgaris*	United States	1.7	3.0	4.0	5.0	6.3
PI 518167	Ch-11	*vulgaris*	China	1.7	2.7	3.3	4.0	4.3
PI 518170	Ch-9b	*vulgaris*	China	2.7	3.7	4.0	5.3	6.3
PI 518314	IDBBNR 5808	*maritima*	United Kingdom	2.7	3.7	3.7	4.0	4.7
PI 538250	C28	*vulgaris*	United States	2.3	.7	3.7	4.0	4.3
PI 558506	FC604	*vulgaris*	United States	nd	nd	nd	nd	nd
733	EL-A1402160	*vulgaris*	2013 PI selections	2.0	3.3	3.7	4.0	5.0
735	EL-A12-00029		2011 PI selections	2.3	3.7	4.0	4.3	4.7
779	EL-A13-02337		2012 PI selections	2.0[w]	3.5	4.0	4.0	4.0
780	EL-A13-02263		PI504285 selections	2.7	3.7	4.0	4.7	5.7
791	EL-A027160		2008 PI selections	2.3	3.0	4.0	4.7	5.0
795	EL-A027162		2008 PI selections	1.7	3.0	3.3	4.0	4.3
817	EL-A12-00022		2011 red selections	2.0	4.0	4.0	4.0	4.0
SR102	PI 675154	*vulgaris*	EL-A029709	1.7	3.0	3.0	4.0	4.0
Leaf Spot Susceptible Check[y]	(12N0050)	USA		3.3	4.3	5.7	6.7	7.0
Leaf Spot Resistant Check[x]	(EL50/2)	USA		1.0	1.3	2.0	2.0	3.0
			$LSD_{0.05}$	0.78	0.80	0.73	0.67	0.89
Trial Mean				2.6	3.8	4.4	5.2	5.8

nd – ratings were not made because of insufficient leaf tissue to rate

[z] Disease Index is based on a scale where 0=healthy to 10=all leaves dead (see text). Each number is an average of three plots except as noted below.

[y] The Leafspot Susceptible Check, 12N0050, is kindly provided by Larry Campbell, USDA-ARS.

[z] The Leafspot Resistant Check is EL50/2 (PI 664912).

[w] Numbers based on average from two plots as either insufficient plants emerged or insufficient leaf tissue remained of one of the replicates after seed stalks were removed to rate

Sugar beet activities of the USDA-ARS East Lansing conducted in cooperation with Saginaw Research & Extension Center during 2015

Mitch McGrath, Linda Hanson, and Tom Goodwill
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 2015 that focused 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 April 30, 2015, the BSDF CRR evaluation nursery was planted on May 1, 2015, and the other evaluation and breeding nurseries on May 6. A randomized complete-block design with one to five replications was used, depending on the specific test. All plots were 15 ft long, with 30 in between rows with the exception of the BSDF CLS nursery, which was planted on 20 in rows. Most entries were commercial or near-commercial varieties, and weeds were controlled with glyphosate at the recommended rates. For non-commercial entries, weeds were controlled with three applications of mixtures of phenmedipham, desmedipham, triflusulfuron methyl, and clopyralid and one application of S-metolachlor. Hand weeding was done as needed to control larger weeds. The BSDF trails 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 control Rhizoctonia damping-off.

The BSDF cooperative CRR Eastern Evaluation Nursery, a recent addition to the SVREC whose activities are complemented by the Western Nursery at Kimberly, Idaho, had entries from four companies, with a total of 249 entries 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 June 24 with a dry ground barley inoculum of *Rhizoctonia solani*, anastomosis group 2-2 (highly virulent isolate) at 0.96 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 were dug August 17, 18, and 19 (three weeks earlier than 2014) with a modified single row harvester. 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 entire nursery ranged from 3.8 to 6.0 (mean = 5.4), with the percent of roots classified as “harvestable” (less than 25% of the root rotted) ranging from 0% to 43% for the different varieties.

The official BSDF cooperative CLS evaluation nursery had entries from three companies, with a total of 222 entries evaluated. This nursery was 2-row, 4 replications conducted in a double-blind fashion. 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 2014 inoculated leaf spot nursery at SVREC. 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 by early September, after which regrowth started to outpace new disease development. Variety means for the commercial nursery were 1.2 on Aug 8 (range = 1 to 2), Aug 13 mean = 2.7 (range = 1 to 4), Aug 20 mean = 4.1 (range 1 to 7), Aug 27 mean = 4.9 (range = 2 to 7), and Sept 3 mean = 5.7 (range = 3 to 8).

In addition to commercial entries, 224 USDA-ARS breeding lines and checks from three USDA cooperators (Fargo, ND, Ft. Collins, CO, East Lansing, MI) were evaluated on three dates; Aug 13, Aug 27, and Sept 9. Fargo entry ratings (24 entries) ranged from 3 to 8 (mean 6.1, standard deviation 1.2) on the last rating. Kimberly entries (14 entries) mean rating was 5.0 (standard deviation 1.2, ranging from 3 to 8) on the same date. Fort Collins' (57 entries) ratings ranged from 3 to 8, with a mean of 5.3 (std, dev. 1.2). East Lansing (94 entries) scores ranged from 3 to 7, with a mean of 4.7 (std. dev. 0.8).

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NSL142025	R&G Pioneer	*vulgaris*	United States	3.3	4.7	6.3	7.0	7.0
NSL176410	Yugo 5	*vulgaris*	Former Serbia&Mont	3.0	4.0	4.3	5.0	4.7
NSL183376	342	*vulgaris*	United States	3.0	4.3	5.3	6.0	7.0
NSL183409	1332	*vulgaris*	United States	2.7	4.0	5.0	6.0	7.0
NSL183444	4326	*vulgaris*	United States	2.7	430	4.7	5.7	6.3
NSL183446	5090	*vulgaris*	United States	2.3	3.3	4.0	5.0	5.3
NSL183461	7411	*vulgaris*	United States	3.0	3.7	4.3	5.0	6.0
PI 169024	Kirmizi	*vulgaris*	Turkey	3.0	5.0	6.7	7.0	7.3
PI 296541	Tetra-Tri-Polanowice	*vulgaris*	Poland	2.0	3.7	4.0	4.3	5.7
PI 357367	Sveklo	*vulgaris*	Macedonia	3.0	4.0	4.3	5.0	6.0
Pl 372276	300/71	*vulgaris*	Poland	2.7	43	5.0	6.0	6.7
PI 372278	Mono-IHAR	*vulgaris*	Poland	2.7	3.7	4.3	5.3	6.3
PI 381644	Ramonskij 23	*vulgaris*	Former Soviet Union	2.7	4.0	5.0	6.0	7.0
PI 470091	IDBBNR 5522	*vulgaris*	United Kingdom	3.0	4.3	5.3	67	7.0
PI 505826	Belocerkovskij Poligibrid 34	*vulgaris*	Former Soviet Union	3.3	4.0	5.0	6.0	7.0
PI 505828	Ganusovskij Poligibrid 8	*vulgaris*	Former Soviet Union	2.3	3.7	4.3	5.7	6.0
PI 506238	FC707(4x)	*vulgaris*	United States	1.7	3.0	3.0	4.0	4.7
PI 507848	IDBBNR 5565	*vulgaris*	Hungary	3.0	4.3	6.0	7.3	7.3
PI 515964	C790	*vulgaris*	United States	2.7	4.0	5.0	6.0	6.7
PI 515965	C796	*vulgaris*	United States	1.7	3.0	4.0	5.0	6.3
PI 518167	Ch-11	*vulgaris*	China	1.7	2.7	3.3	4.0	4.3
PI 518170	Ch-9b	*vulgaris*	China	2.7	3.7	4.0	5.3	6.3
PI 518314	IDBBNR 5808	*maritima*	United Kingdom	2.7	3.7	3.7	4.0	4.7
PI 538250	C28	*vulgaris*	United States	2.3	.7	3.7	4.0	4.3
PI 558506	FC604	*vulgaris*	United States	nd	nd	nd	nd	nd
733	EL-A1402160	*vulgaris*	2013 PI selections	2.0	3.3	3.7	4.0	5.0
735	EL-A12-00029		2011 PI selections	2.3	3.7	4.0	4.3	4.7
779	EL-A13-02337		2012 PI selections	2.0[w]	3.5	4.0	4.0	4.0
780	EL-A13-02263		PI504285 selections	2.7	3.7	4.0	4.7	5.7
791	EL-A027160		2008 PI selections	2.3	3.0	4.0	4.7	5.0
795	EL-A027162		2008 PI selections	1.7	3.0	3.3	4.0	4.3
817	EL-A12-00022		2011 red selections	2.0	4.0	4.0	4.0	4.0
SR102	PI 675154	*vulgaris*	EL-A029709	1.7	3.0	3.0	4.0	4.0
Leaf Spot Susceptible Check[y]	(12N0050)	USA		3.3	4.3	5.7	6.7	7.0
Leaf Spot Resistant Check[x]	(EL50/2)	USA		1.0	1.3	2.0	2.0	3.0
			$LSD_{0.05}$	0.78	0.80	0.73	0.67	0.89
Trial Mean				2.6	3.8	4.4	5.2	5.8

nd – ratings were not made because of insufficient leaf tissue to rate

[z] Disease Index is based on a scale where 0=healthy to 10=all leaves dead (see text). Each number is an average of three plots except as noted below.

[y] The Leafspot Susceptible Check, 12N0050, is kindly provided by Larry Campbell, USDA-ARS.

[z] The Leafspot Resistant Check is EL50/2 (PI 664912).

[w] Numbers based on average from two plots as either insufficient plants emerged or insufficient leaf tissue remained of one of the replicates after seed stalks were removed to rate

Efficacy of application of foliar fungicides for control of Cercospora leaf spot in sugar beet, 2015.

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Sugar beet cv. ACH RR-824 was PAT-treated and planted at the Michigan State University Bean and Beet Farm, Richville, MI on 25 May. Seed was planted at 1" depth into four-row by 25-ft plots (ca. 4.375 in. between plants to give a target population of 275 plants/100ft. row) with 30" 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). No additional nitrogen was applied to the growing crop. Plots were inoculated by spraying a conidial suspension of *C. beticola* collected from infected sugarbeet foliar residue from the previous season on 16 Jun across all plots. Fungicides were applied starting after the 35 or 45 Beetcast disease severity values were recorded in the area on 8 and 15 Jul, respectively (Ontario Weather Network, Ridgetown, ON, Canada), applications were initiated on 8 Jul and three to five applications were made as specified in the table below. Fungicides were applied with a hand-held R&D spray boom delivering 25 gal (80 p.s.i.) and using three XR11003VS nozzles per row. Induce 480XL 0.25 % v/v was applied where indicated as "Induce" on the results table unless a different rate was indicated. Weeds were controlled by cultivation and with Roundup Original Max 2.0 pt applied at GS2-4 and GS 6-8. Insects were controlled as necessary. Foliar leaf spot severity (%) was measured on 24 Aug and 5 Sep using a 0 – 10 scale; 0= 0%; 1= 1 - 5, 0.1%; 2= 6 -12, 0.35%; 3= 13 - 25, 0.75%; 4= 26 - 50, 1.5%; 5= 51 - 75, 2.5%; spots/leaf or severity %; respectively; 6= 3% (proven economic damage); 7= 6%; 8= 12%; 9= 25%; and 10≥ 50% severity. Beetroots were machine-harvested on 10 Oct and individual treatments were weighed. Sugar content was measured at the Michigan Sugar Company analytical service laboratory. 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 (^{o}F) was 45.4, 60.3, 64.2, 69.6, 68.0, and 64.8 (Apr, May, Jun, Jul, Aug, and Sep, respectively) and the number of days with maximum temperature >90^{o}F over the same period was 0 for each month except Jul with 2 days. Average daily relative humidity (%) over the same period was 63.7, 63.2, 67.9, 66.8, 72.8 and 70.9. Precipitation over the same period was 1.97, 2.86, 2.68, 2.2, 3.94, and 6.56". There were 226 Beetcast DSV values accumulated in the Saginaw area from 1 May to 30 Sep at Richville, MI.

Weather conditions during the growing season at Richville, MI were conducive for the development of Cercospora leaf spot (CLS) for most of the season and of note was the lack of hot and humid conditions during Jul with only two days with temperatures >90^{o}F F. CLS severity (%) reached 4.0, 21.3 and 42.5% in the not-treated control by 5, 11, 18 and 28 Aug, respectively (not all data not shown in table). All treatments had significantly less CLS severity (%) than the not-treated control (42.5%) by 10 Sep. Treatments with CLS RAUDPC values less than 17.3 were significantly different to the not-treated control (36.8) by 28 Aug. CLS reached a mean Bayer index of 5.3, 7.5, 9.3 and 10.0 in the not-treated control during the same period. Treatments with CLS Bayer indices less than 7.5 had significantly less Cercospora leaf spot than the not-treated control (10.0) by 28 Aug. All treatments had significantly greater yield per acre than the untreated control (13.6 t) and the range in yield (treated plots) was from 19.6 to 26.9 t/A. Treatments with sugar content (%) greater than 14.3% had significantly greater sugar content than the not-treated control (13.6%) and the range in sugar content (treated plots) was from 14.6 to 15.9%. Treatments with recoverable white sucrose per ton (RWST lb) greater than 204 lb had significantly greater RWST than the not-treated control (192 lb) and the range in RWST (treated plots) was from 204 to 229 lb. No treatments had significantly greater recoverable white sucrose per acre (RWSA) than the untreated control (3362 lb) and the range in RWSA (treated plots) was from 4160 to 5649 lb. No phytotoxicity was noted in any plots.

Treatment and rate	Cercospora leaf spot Severity (%) 10 Sep 13 DAFA[a]		RAUDPC[b] (0-100) 10 Sep		Bayer 0-10 scale[c] 10 Sep		Yield (t)		Sugar content (%)		RWST[d] (lb)		RW SA[e] (lb)
Inoculated Check……..	68.5	a	36.8	a	10.0	a	13.5	f	13.6	e	192	g	3362
Eminent 125SL 1SL 13 fl oz (ABCD)…..	3.8	d-g	1.0	cde	5.3	e-h	20.1	e	15.2	abc	218	a-e	4641
Eminent 125SL 1SL 13 fl oz + Badge 2.27SC 16 fl oz + Kinetic 90SL 8 fl oz (ABCD)……...	5.8	def	1.8	cde	5.8	d-g	22.2	a-e	14.3	de	204	fg	4777
Eminent 125SL 1SL 13 fl oz + Badge 2.27SC 32 fl oz + Kinetic 90SL 8 fl oz (ABCD)……...	2.2	d-g	0.7	cde	3.8	f-i	26.9	a	15.5	ab	222	abc	4409
Eminent 125SL 1SL 13 fl oz + Badge 2.27SC 48 fl oz + Kinetic 90SL 8 fl oz (ABCD)……...	3.5	d-g	2.1	cde	4.8	e-i	22.5	a-e	15.3	abc	219	a-e	4769
Eminent 125SL 1SL 13 fl oz + Topsin 70W 70WG 0.5 lb + Kinetic 90SL 8 fl oz (ABCD)……...	3.9	d-g	1.3	cde	5.0	e-h	22.2	a-e	15.5	abc	221	a-e	4749
Eminent 125SL 1SL 13 fl oz + Topsin 70W 70WG 1 lb + Kinetic 90SL 8 fl oz (ABCD)……...	5.8	def	2.4	cd	5.8	d-g	21.8	a-e	15.0	bcd	214	b-f	5182
Minerva Duo 1SC 16 fl oz + Kinetic 90SL 8 fl oz (ABCD)……...	1.1	g	0.6	de	2.3	i	20.9	cde	15.6	ab	223	abc	4709
Manzate 4F 4FL 3.2 pt (AC); Eminent VP 1ME 13 fl oz + Badge 2.27SC 48 fl oz (B); Inspire XT 4.16SL 7 fl oz + Manzate 4F 4FL 3.2 pt (D); Super Tin 4L 4FL 8 fl oz + Badge 2.27SC 48 fl oz (E) Kinetic 90SL 8 fl oz (ABCDE)…….	19.8	c	12.8	b	8.0	a-d	20.1	e	15.2	abc	217	a-e	5649
Manzate 4F 4FL 3.2 pt (AC); Eminent VP 1ME 13 fl oz + Topsin 70W 70WG 1 lb (B); Inspire XT 4.16SL 7 fl oz + Manzate 4F 4FL 3.2 pt (D); Super Tin 4L 4FL 8 fl oz + Badge 2.27SC 48 fl oz (E) Kinetic 90SL 8 fl oz (ABCDE)…….	35.6	b	17.3	ab	8.8	ab	22.3	a-e	14.9	bcd	213	c-f	4368
Enable 2F 10 fl oz + Dithane F-45 37F 3.2 pt + Kinetic 90SL 8 fl oz (ABCD)……...	1.8	efg	0.5	e	3.0	hi	22.7	a-e	15.4	abc	220	a-e	4352
Enable 2F 10 fl oz (AC); Priaxor 4.17SC 8 fl oz (B); Super Tin 4L 4FL 8 fl oz (D)……	26.7	bc	11.4	b	8.5	abc	21.1	cde	14.6	cd	208	ef	4140
Enable 2F 10 fl oz (AC); Super Tin 4L 4FL 8 fl oz (B); Cuprofix Ultra Disperss 40DF 3 lb (D)…	24.8	bc	13.9	b	8.5	abc	24.2	a-e	15.4	abc	220	a-e	5478
Minerva 1SC 13 fl oz (A); Super Tin 4L 4FL 8 fl oz + Koverall 75WG 1.5 lb (B); Headline 2.09SC 9 fl oz (C)……..	4.7	d-g	1.4	cde	5.5	d-h	19.6	e	15.4	abc	220	a-e	4938
Minerva Duo 1SC 16 fl oz (A); Super Tin 4L 4FL 8 fl oz + Koverall 75WG 1.5 lb (B); Headline 2.09SC 9 fl oz (C)……..	3.7	d-g	1.2	cde	4.3	e-i	22.7	a-e	15.2	a-d	217	a-f	5641
Proline 480SC 5.7 fl oz (A); Super Tin 4L 4FL 8 fl oz + Koverall 75WG 1.5 lb (B); Headline 2.09SC 9 fl oz (C)……..	7.3	d	2.8	c	6.5	b-e	23.9	a-e	15.4	abc	220	a-e	5010
SA-004309 SC 21 fl oz (A); Super Tin 4L 4FL 8 fl oz + Koverall 75WG 1.5 lb (B); Headline 2.09SC 9 fl oz (C)……..	5.8	def	2.4	cd	5.8	d-g	25.8	abc	14.9	bcd	212	c-f	4656
SA-004310 SC 32 fl oz (A); Super Tin 4L 4FL 8 fl oz +	6.8	de	2.4	cd	6.0	c-f	20.4	de	15.6	ab	229	a	4668

Treatment and rate	Cercospora leaf spot Severity (%) 10 Sep 13 DAFA[a]		RAUDPC[b] (0-100) 10 Sep		Bayer 0-10 scale[c] 10 Sep		Yield (t)		Sugar content (%)		RWST[d] (lb)		RWSA[e] (lb)
Koverall 75WG 1.5 lb (B); Headline 2.09SC 9 fl oz (C)…….. SA-004303 SC 32 fl oz (A); Super Tin 4L 4FL 8 fl oz + Koverall 75WG 1.5 lb (B); Headline 2.09SC 9 fl oz (C)……..	2.7	d-g	0.7	de	4.5	e-i	25.4	a-d	14.9	bcd	209	def	5064
SA-004309 SC 21 fl oz (A); Super Tin 4L 4FL 8 fl oz + Koverall 75WG 1.5 lb (B); Super Tin 4L 4FL 8 fl oz (C)……	2.7	d-g	1.1	cde	4.5	e-i	25.9	abc	15.9	a	227	ab	4649
Minerva Duo 1SC 16 fl oz (A); Super Tin 4L 4FL 8 fl oz + Topsin 4.5FL 7.6 fl oz (B); Headline 2.09SC 9 fl oz (C)……..	3	d-g	0.8	cde	4.8	e-i	21.4	b-e	15.6	ab	223	abc	4623
Inspire XT 4.16SL 7 fl oz (A); Super Tin 4L 4FL 8 fl oz + Koverall 75WG 1.5 lb (B); Headline 2.09SC 9 fl oz (C)……..	3.8	d-g	1.0	cde	5.3	e-h	23.7	a-e	15.0	bcd	214	b-f	4709
Super Tin 4L 4FL 8 fl oz + ManzateMax 4FL 1.6 qt (AC); Inspire XT 4.16SL 7 fl oz + ManzateMax 4FL 1.6 qt (B); Cuprofix Ultra Disperss 40DF 3 lb + ManzateMax 4FL 1.6 qt (D)…….	1.4	fg	0.4	e	3.0	hi	21.6	b-e	15.6	ab	222	a-d	5015
Super Tin 4L 4FL 8 fl oz + ManzateMax 4FL 1.6 qt (AC); Proline 480SC 5.7 fl oz + ManzateMax 4FL 1.6 qt (B); Cuprofix Ultra Disperss 40DF 3 lb + ManzateMax 4FL 1.6 qt (D)…….	4.3	d-g	1.8	cde	4.3	e-i	26.4	ab	15.4	abc	216	a-f	4980
Super Tin 4L 4FL 8 fl oz + ManzateMax 4FL 1.6 qt (AC); Eminent VP 1ME 13 fl oz + ManzateMax 4FL 1.6 qt (B); Cuprofix Ultra Disperss 40DF 3 lb + ManzateMax 4FL 1.6 qt (D)…….	2.1	d-g	0.8	cde	3.3	ghi	24.6	a-e	14.9	bcd	212	c-f	5411
p-value if NSD													0.35

[a] DAFA= Days after final fungicide application

[b] RAUDPC = The relative area under the percentage Cercospora leaf spot disease progress curve calculated for each treatment from the date of the first evaluation to 10 Sep, a period of 27 days (Max = 100)

[c] Foliar leaf spot severity; 0 - 10 scale; 0= 0%; 1 = 1 - 5, 0.1%; 2 = 6 -12, 0.35%; 3 = 13 - 25, 0.75%; 4 = 26 - 50, 1.5%; 5 = 51 - 75, 2.5%; spots/leaf or severity %; respectively; 6 = 3% (proven economic damage); 7 = 6%; 8 = 12%; 9 = 25%; and 10 $\geq$ 50% severity

[d] RWST= Recoverable White Sucrose per Ton

[e] RWSA = Recoverable White Sucrose per Acre (Ton* Recoverable White Sucrose per Ton of sugarbeet)

[e] Means followed by same letter are not significantly different at $p = 0.05$ (Fishers LSD)

[f] Application dates: A= 8 Jul; B= 15 Jul; C= 29 Jul; D= 5 Aug; E= 19 Aug ; F= 28

Control of Rhizoctonia crown and root rot with fungicides in sugarbeet, 2015.

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Sugar beet cv. ACH RR-824 was PAT-treated and planted at the Michigan State University Bean and Beet Farm, Richville, MI on 17 Apr. Seed was planted at 1" depth into four-row by 50-ft plots (ca. 4.375 in. between plants to give a target population of 275 plants/100ft. row) with 30" 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 XR8003 nozzle per row in a 6" band at planting (A) or at GS 4-6 (B). Applications were made at planting (A); and banded applications on 7 Jun at GS 4-6 (B), respectively. Cercospora leaf spot was controlled with an application of Eminent 125SL (13 fl oz) + Koverall 75DF (1.5 lb) on 8 Jul and Inspire 2.08EC (7 fl oz) + Kocide 3000 46.1WG (2 lb) on 29 Jul and Super Tin 4L (8 fl oz) + ManzateMax 4FL (1.6 qt) on 19 Aug. Weeds were controlled by cultivation and with Roundup Original Max 2.0 pt/A applied at GS2-4 and GS 6-8. Insects were controlled as necessary. Plant stand was rated 18, 24 and 40 days after planting (DAP) and relative rate of emergence was calculated as the Relative Area Under the Emergence Progress Curve [RAUEPC from 0 – 40 DAP, maximum value = 100]. Plots were inoculated on 17 May [30 days after planting (DAP)] by spreading *R. solani* Anastemoses Group 2.2 (IIIB) infested millet across all plants in each plot. Incidence of infected plants was evaluated on 40 and 168 DAP. Samples of 50 beets per plot were harvested 168 DAP (10 ft from start of each plot from two center rows) and assessed for crown and root rot (*R. solani*) incidence (%) and severity. Severity of crown and root rot was measured as an index calculated by counting the number of roots (n = 20) falling in class 0 = 0%; 1 = 1 - 5%; 2 = 6 -10%; 3 = 11 – 15%; 4 =15 - 25%; 5 = 25 – 50%; 6 = 50 – 100% 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. The trial was not harvested for yield assessment due to the high incidence and severity of crown and root rot. 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 (^{o}F) was 45.4, 60.3, 64.2, 69.6, 68.0, and 64.8 (Apr, May, Jun, Jul, Aug, and Sep, respectively) and the number of days with maximum temperature >90^{o}F over the same period was 0 for each month except Jul with 2 days. Average daily relative humidity (%) over the same period was 63.7, 63.2, 67.9, 66.8, 72.8 and 70.9. Precipitation over the same period was 1.97, 2.86, 2.68, 2.2, 3.94, and 6.56".

Soil temperature and moisture conditions enhanced development of crown and root rot throughout the season although severe symptoms did not appear until Aug. No treatments had significantly greater plant stand in comparison to the non-inoculated not-treated check (84.5%). Treatments with final plant stand less than 73.8% had significantly lower plant stand in comparison the non-inoculated not-treated check. Treatments with final plant stand greater than 73.8% had significantly higher plant stand in comparison the inoculated not-treated check (64.0%). No treatments were significantly different from either check in terms of RAUEPC. The evaluations of crown and root 40 and 168 DAP indicated that treatments with less than 3.6% and 6.5% incidence, respectively of dead or dying plants were significantly different from the inoculated not-treated check (8.2 and 16.3%, respectively). All treatments had a significantly lower severity index of crown and root rot on the beetroots in comparison to the inoculated not-treated check (80.3). Treatments with severity index

values of crown and root rot on the beetroots that ranged from 31.4 to 47.3 were not significantly different from the non-inoculated not-treated check (32.7) indicating a high level background crown and root in the trial site. Treatments with greater than 73.4% marketable beets were significantly different from inoculated not-treated check (39.9%). Treatments with greater than 94.9% marketable beets were not significantly different from the non-inoculated not-treated check (100%). However, the percentage of marketable beets was high in comparison to previous years trials in terms of marketable beetroots perhaps due to the onset of Rhizoctonia root rot during the latter part of the season. The range in 2014 was from 35 to 59% marketable and the non-inoculated not-treated check inoculated not-treated check had 55 and 48% marketable beets, respectively. In 2015, the range was from 73.4 to 100 % across treatments. 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[a])= at planting (B)= at GS4-6	Plant stand[b] 40 DAP[c] (%)		RAUEPC[d] 0 – 40 DAP	Crown and root rot Incidence 40 DAP (%)		Incidence 168 DAP (%)		Severity[e] 168 DAP (%)		Marketable beets (%)[f]	
Non-inoculated Check…….	84.5	a[g]	68.6	0.9	j	1.5	gh	32.7	fg	100	a
Inoculated Check…….	64.0	efg	63.1	8.2	a	16.3	a	80.3	a	39.9	h
Quadris 2.08SC 0.6 fl oz (A)……..	75.2	a-d	58.0	1.8	f-i	2.7	e-h	49.5	bcd	84.7	c-g
Quadris 2.08SC 0.6 fl oz (B)……..	75.0	a-d	65.1	2.0	d-h	3.4	c-g	33.7	efg	86.4	c-g
Headline 2.09SC 0.517 fl oz (A)….	67.1	c-g	56.3	1.1	ij	1.4	h	34.6	d-g	95.6	a-d
Xanthion IF Comp A Integral 3.66SC 0.069 fl oz + Xanthion IF Comp A Headline 3.66SC 0.517 fl oz (A)….	71.9	b-e	62.4	1.6	g-j	2.6	fgh	37.1	c-g	94.9	b-e
Xanthion IF Comp A Integral 3.66SC 0.069 fl oz + Xanthion IF Comp A Headline 3.66SC 0.517 fl oz (A); Priaxor 4.17SC 0.385 fl oz (B)……	68.4	b-f	62.9	1.7	g-j	3.9	b-f	31.4	g	100	a
Priaxor 4.17SC 0.385 fl oz (B)……	75.9	a-d	64.1	2.0	e-h	4.3	b-f	32.7	fg	96.3	abc
Moncut 70 DF 70DF 0.92 oz (A)…	75.0	a-d	60.9	1.6	hij	3.9	b-f	39.4	c-g	83.2	d-g
Moncut 70 DF 70DF 1.84 oz (A)…	78.7	ab	61.0	1.9	f-i	4.3	b-f	42.5	b-g	90.9	b-f
Moncut 70 DF 70DF 0.92 oz (A)…	67.0	c-g	61.2	2.4	c-h	5.1	b-e	34.9	d-g	94.9	b-e
Moncut 70 DF 70DF 0.92 oz (B)…	73.8	a-e	65.1	1.6	g-j	5.1	b-e	43.2	b-g	87.4	c-g
Moncut 70 DF 70DF 0.92 oz (B)…	77.6	abc	65.1	2.6	b-g	5.0	b-f	32.1	fg	90.3	b-f
Moncut 70 DF 70DF 1.84 oz (B)…	69.7	b-e	64.5	2.9	b-e	5.3	bcd	36.8	c-g	98.1	ab
Vertisan 1.67EC 1.38 fl oz (A)…..	72.2	b-e	59.2	3.1	bcd	4.9	b-f	48.9	b-e	80.6	fg
Quadris 2.08SC 0.4 fl oz (A)……..	71.9	b-e	53.6	3.2	bc	6.5	b	35.2	d-g	90.6	b-f
Quadris 2.08SC 0.4 fl oz (B)……..	69.0	b-f	62.1	3.5	b	4.9	b-f	51.7	bc	86.8	c-g
Serenade Soil 1.34F 1.84 fl oz (A); Proline 480SC 0.33 fl oz (B)……..	69.4	b-f	55.9	3.6	b	5.9	bc	42.9	b-g	85.8	c-g
Serenade Soil 1.34F 3.67 fl oz (A); Proline 480SC 0.33 fl oz (B)……..	66.1	d-g	55.1	3.2	bc	3.2	d-h	56.5	b	73.4	g
Proline 480SC 0.33 fl oz (A); Quadris 2.08SC 0.6 fl oz (B)……..	59.5	fg	51.5	2.8	b-f	3.4	c-g	47.3	b-f	81.7	efg
Aproach 2.08SC 0.6 fl oz (A)…….	57.7	g	52.2	2.4	c-h	4.7	b-f	49.8	bcd	86.8	c-g
Aproach 2.08SC 0.8 fl oz (A)…….	70.2	b-e	63.6	2.5	b-h	3.1	d-h	47.3	b-f	85.7	c-g
Aproach 2.08SC 0.6 fl oz (B)…….	70.0	b-e	65.5	2.0	d-h	3.4	c-g	52.1	bc	82.5	d-g
p-value if NSD			0.613								

[a] Application dates; A= 17 Apr; B= 7 Jun.

[b] Plant stand expressed as a percentage of the target population of 275 plants/100ft. row from a sample of 2 x 50 ft rows per plot.

[c] DAP = days after planting on 17 Apr.

[d] Relative area under the emergence progress curve from planting to 40 days after planting.

[e] Severity of crown and root rot was measured as an index calculated as described in the text.

[f] The number of beets falling into classes 0 – 3 was summed and a percentage calculated as marketable beets.

[g] Means followed by same letter are not significantly different at $p = 0.05$ (Fishers LSD).

2015 DRY BEAN YIELD TRIALS

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Plant, Soil and Microbial Sciences

The dry bean breeding program initiated its seventh season on the new 320 acre Saginaw Valley Research & Extension Center (SVREC) research farm near Frankenmuth in 2015. A total of 1723 yield trial plots (12 tests) were harvested in 2015 and 1655 single plant selections were made in the early generation nurseries. Yield trials at the Saginaw Valley Research Extension Center (SVREC) near Richville included 42-entry standard navy test; 30-entry standard black test; 56-entry prelim navy tests; 72-entry prelim black test; 42-entry standard GN and pinto test; 20-entry standard red/pink test; 48-entry prelim red test; 24-entry drought trial and 48-entry Co-op and regional test that includes pinto, GN, red and pinks. At the Montcalm Research Farm (MRF) near Entrican yield trials included 56-entry kidney and bush cranberry test; 64-entry white mold test; and 9 entry BNF test. All trials were direct harvested except for kidney and cranberry beans at Montcalm. Temperatures were moderate for the 2015 season and only exceeded 90F for a few days in July. Overall rainfall for the 3-summer months at SVREC was equivalent to the 30-year average of 8.5". A moderate dry period occurred from June 16-July 13 with only 0.7" of rainfall which reduced the overall plant size and resulted in lower overall yields. A high incidence of common bacterial blight resulted in the nurseries and allowed for selection of resistant lines in a range of seed types.

Rainfall patterns at MRF were more extreme with a total rainfall of over 5" within two days of planting. This resulted in major flooding in some areas, soil crusting and compaction in other areas which resulted in low germination. In addition soil temperatures remained low in this critical period and a high incidence of root rot diseases occurred which also reduced germination and stands. The Andean kidney and cranberry beans were the most affected by the stresses whereas the Mesoamerican small and medium seeded black, navy, pinto, GN, and red beans managed to tolerate the conditions and had near normal stands. Overall vigor of the kidney and cranberry beans was poor resulting in small plants that had low overall yields. The unfavorable conditions allowed for the selection of early generation lines with improved tolerance to root rot and with resistance to common bacterial blight in the kidney bean nurseries. White mold plots at MRF had supplemental irrigation to encourage disease development. However, disease incidence in the National Sclerotinia Initiative nursery was very low in the susceptible checks despite the overall lower temperatures and excess irrigation. The major disease problem at Montcalm was the presence of severe root rots mainly Fusarium that was accentuated by the cooler soil conditions early in the season. The unfavorable condition allowed for the selection of lines with increased tolerance to root rot and with resistance to common bacterial blight in the kidney bean nurseries.

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. 5101: Standard Navy Bean Yield Trial

This 42-entry trial included standard commercial navy bean varieties, and advanced lines from the MSU breeding program, which carry the N-prefix. Yields ranged from 14.6 to 28.7 cwt/acre with a mean of 21.3 cwt/acre. Variability in this trial was high (CV=14.9%) and the LSD needed for significance was 3.7 cwt/acre. Many entries failed to effectively partition and dry down properly and several exhibited severe leaf retention at maturity. Seven MSU lines significantly out-yielded the test mean and included two top yielding lines from 2012 and 2013 trials, as well as several promising lines from 2014 prelim navy trial. The newly released variety Alpena performed well, slightly out yielding Merlin and was the top yielding commercial variety. Mist was the highest yielding Canadian variety tested at 21.3 cwt/acre. Mist outyielded Lighthouse, and performed significantly better than T9905 and Fathom. Medalist was the lowest yielding variety as a result of severe leaf retention and failure to dry down. Canning tests will be conducted on all new MSU breeding lines before being considered for release.

Expt. 5102: Standard Black Bean Yield Trial

This 30-entry trial included the standard commercial black bean varieties and advanced breeding lines. Yields ranged from 18.3 to 31.3 cwt/acre with a test mean of 23.8 cwt/acre. Variability was moderate in this test, (CV=12.6%) and the LSD was 3.5 cwt/acre. Five entries significantly outyielded the test mean including top three that were crosses with stress tolerant lines from outside the MSU program. The other two top were B14302 and B14303 lines that showed excellent yield potential in 2014 prelim trial. All top five lines also showed excellent levels of resistance to CBB. Zenith was the top commercial variety at 23.3 cwt/acre and significantly outyielded Zorro. NDSU line NDF09304 ranked just below Zenith, followed by Eclipse, and then Shania. T-39 was the lowest performing variety in the trial. Four entries showed complete resistance to CBB and were among the highest yielding lines despite severe disease pressure. Canning tests will be conducted on breeding lines to ensure only those with canning quality similar to Zenith are advanced.

Expt. 5103: Preliminary Navy Bean Yield Trial

This 56-entry trial included new navy bean lines and check varieties. Yields ranged from 13.8 to 31.1 cwt/acre with a mean of 21.9 cwt/acre. Variability was moderate in this 3-rep test (CV=12.3%) and the LSD was 3.7 cwt/acre. Ten lines significantly outyielded the test mean including several with improved levels of CBB resistance. Alpena yielded above the mean at 23.5 cwt/acre. New germplasm release from Puerto Rico PR0806-80A yielded 22 cwt/acre, while PR0806-81A was lower yielding (17.2cwt). Merlin (17.3 cwt) and Medalist (16.5 cwt) were among the lowest yielding entries due to poor dry down as in test 5101. Future advances of many of the new breeding lines will largely depend on disease reactions and canning quality of the entries.

Expt. 5104: Preliminary Black Bean Yield Trial

This 72-entry trial included new black bean lines and check varieties. Yields ranged from 16.4 to 36.6 cwt/acre with a mean of 30.3 cwt/acre. Test 5104 was the top yielding test in 2015 and was overall higher yielding than the standard test 5102, suggesting the yield potential of new black bean lines. Variability was well controlled in this 3-rep test (CV=9.2%) and the LSD was 3.8 cwt/acre.

Eight lines significantly outyielded the test mean. Zenith (31.1cwt) significantly outyielded Zorro (25.4cwt) as in test 5102. 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. 5105: Standard Great Northern and Pinto Bean Yield Trial

This 42-entry trial included MSU great northern and otebo breeding lines (G-prefix) as well as pinto lines (P-prefix) and standard commercial check varieties. The test ranged in yield from 10.2 to 24.7 cwt/acre with a mean yield of 18.5 cwt/acre. Variability was high (CV= 13.5%) resulting in a LSD value of 2.9 cwt/acre needed for significance. Eight entries significantly outperformed the test mean and included Eldorado and Lapaz pinto and the new Samurai otebo varieties. Samurai nearly matched the productivity of Eldorado, which represents a great improvement from previous bush type otebo varieties. Three great northern breeding lines, pinto PT11-13 that performed well in 2014 MRPN nursery, and P14815 that exhibits excellent dry down and agronomic characteristics completed this top yielding group. Powderhorn and Matterhorn GN varieties were among the lowest yielding entries, suffering from poor dry down similar to some navy varieties. Likewise, SF103-8 slow darkening pinto failed to mature properly and was the lowest yielding entry, contrasting to its performance in 2014. The other slow darkening pinto in the test 23ST-27 also yielded below the test mean. In statewide testing at four locations, Samurai yielded 27.4 cwt compared to 21.5 cwt for the Fuji variety. Samurai is an upright type suitable for direct harvest and is comparable in yield to current upright black and navy bean varieties.

Expt. 5106: Standard Small Red and Pink Bean Yield Trial

This 20-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 19.7 to 32.4 cwt/acre with a mean yield of 25.1 cwt/acre. Variability was low (CV=9.4%) resulting in a LSD value of 2.8 cwt/acre for significance. Three small red varieties including Viper and Ruby and R13752 breeding line outperformed the test mean. Seed size of Viper (30g) and Ruby (34g) is significantly smaller than that of Merlot (40g). Merlot red and Rosetta pink performed above the trial mean, while Desert Song and Gypsy Rose ranked below the mean yield. R12844 which has performed well in previous years was equivalent to Merlot. Sibling family members R12843-45 showed improved levels of CBB resistance compared to commercial varieties. Likewise family S14706-08 showed similar CBB resistance in the pink seed class. Progress in small red breeding program 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 lines will be evaluated for canning quality and BCMV reaction prior to advancing to 2016 trials.

Expt. 5107: Preliminary Small Red and Pink Bean Yield Trial

This 48-entry trial included new small red (R-prefix) and pink bean (S-prefix) lines from MSU as well as new breeding lines from USDA-Washington (SR and PK codes) along with check varieties. Yields ranged from 18.6 to 36.9 cwt/acre with a mean of 25.8 cwt/acre. Variability was well controlled in this 3-rep test (CV=9.7%) and the LSD was 3.4 cwt/acre. Nine lines significantly out-yielded the test mean. Several top lines from test 5106 were in this group including Viper, Ruby,

R12844, and R12845. Viper was the top yielder (36.9 cwt) with the smallest seed size and longer maturity (102d). WA breeding line PK12-3 was the only pink in this group and was equivalent to Ruby. The remaining top lines were selections made from R12844-45. R13752 performed well at 28.4 cwt/acre but was not significantly better than the trial mean. Merlot and Rosetta yielded similarly to test 5106. Some new R15 lines showed similar levels of CBB resistance to R12843-45 family although disease pressure was generally lower in this trial as in test 5106. Future advances of many of the new breeding lines will largely depend on disease reactions and canning quality of the entries.

Expt. 5108: 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 and great northern 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 48-entry trial ranged in yield from 7.8 to 32.8 cwt/acre with a mean of 22.6 cwt/acre. Variability was moderate (CV=12.7%) resulting in a LSD value (3.9 cwt/acre) for significance. As a result eleven lines were significantly higher in yield than the test mean including MSU varieties Eldorado and Desert Song. In the top group were pinto lines from MSU, USDA-WA, Colorado, and Idaho Seed Bean. Performance of slow darkening pintos SF103-8 and 23ST-27 from NDSU was similar to test 5105. New slow darkening pintos from CSU (COSD-prefix) were included in this test and ranged in yield from 24.9-18.6 cwt/acre with many of them exhibiting poor dry down similar to SF103-8. At this point none of the new slow darkening pintos appear to match the traditional lines in yield potential. Samurai fell below the average in this trial. 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 in this trial.

Expt. 5209: Standard Andean Bean Yield Trial

This 56-entry trial was conducted 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), cranberry, and yellow bean varieties from MSU and CDBN under supplemental irrigation (4x total 2.4”). A prominent feature of this trial was prevalence of severe Fusarium root rot induced by 5” rain prior to seedling emergence. Stand counts were taken and rated on 1-5 scale, 1 under 10%, 3 equivalent to 50% and 5 above 90%. Although new efforts to control variability due to deer feeding at this site were effective, yields varied widely from 8.7 to 30.0 cwt/acre with a mean of 17.6 cwt/acre due largely to the incidence of soil borne diseases. Variability was extremely high (CV=24.3%) resulting in a LSD value of 5.0 cwt/acre needed for significance. Fourteen breeding lines significantly out-yielded the test mean, including nine commercial varieties across DRK, LRK, WK, and cranberry seed types. The remaining lines in this group were the yellow bean lines MSU Y11405 and OSU DBY-28-1 and new DRK series K15302-304. These results were encouraging in that the test allowed for selection of root rot tolerant varieties and lines across market classes that will be useful for improving root rot resistance of future Andean breeding lines. Several new varieties were tested including NDSU Rosie (LRK) that showed excellent root rot resistance, Talon (DRK), and private varieties Chaparral (DRK) and Big Red (LRK). Fusarium root rot was

determined to be the major disease problem in these soils and its presence allows for continued selection for resistance in large seeded kidney bean lines. Since canning quality is vital in kidney beans, only those DRK lines equivalent in canning quality to Red Hawk, LRK lines equal or better than CELRK and WK lines equivalent to Beluga will be advanced in 2016.

Expt. 5210: National White Mold Yield Trial

This 64-entry trial was conducted at Montcalm 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 Guelph. 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 9 times for a total of 5.85" to maintain adequate levels of moisture for favorable disease development at the critical flowering period. Natural white mold infection occurred, but disease severity was generally low in 2015 across the entire trial despite generally favorable weather conditions in terms of rainfall and moderate temperatures. The same stressful conditions following planting resulted in overall poor early growth and a smaller plant canopy at flowering. 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 11.1 to 37% with a mean value of 17.3% in 2015. The test ranged in yield from 8.6 to 34.7 cwt/acre with a mean yield of 22.9 cwt/acre. Variability was high (CV=14.7%), thus a high LSD value (4.6 cwt/acre) was needed for significance. As a result 14 lines significantly out-yielded the test mean and included the Eldorado, Zenith, Ruby, and Viper varieties along with black, navy, great northern, and small red lines. Also among those entries exceeding the test mean were Samurai and Lighthouse. Bunsi (resistant) and Beryl (susceptible) checks were among the lowest yielding entries and had similarly low disease scores due to the low disease pressure. G122 (resistant check) was the lowest yielding entry similar to previous years. Yields of pink and some small red lines were also reduced due to poor stand (1-5) but overall this trial had better tolerance to the Fusarium root rot that severely damaged stands in the Andean seed types (test 5209) at Montcalm in 2015. This trial will continue to be part of the breeding effort to improve tolerance to white mold in 2016.

Expt. 5111: National Dry Bean Drought Nursery

This 24-entry trial was conducted at the SVREC to evaluate a series of breeding lines identified through shuttle breeding as possessing improved levels of drought stress. The trial was replicated by colleagues at various locations across the US. Yields ranged from 13.6 to 30.8 cwt/acre with a mean of 21.8 cwt/acre. Variability was moderate (CV=12.6%) and the LSD needed for significance was 3.8 cwt/acre. Six lines significantly out-yielded the test mean, including varieties Zenith, and Stampede. Zorro, Powderhorn, and Matterhorn were also above test mean, with Merlot and Marquis among the lower yielding entries. Since rainfall patterns were adequate in 2015, these results were similar to those observed in the near ideal growing conditions of 2014.

Early Generation Breeding Material grown in Michigan in 2015

F3 through F5 lines	**F2 populations**
Navy and Black - 89 lines	Navy and Black -115 populations
Pinto - 297 lines	Pinto - 65 populations
GN - 578 lines	GN - 49 populations
Pinks and Reds – 210 lines	Pinks and Reds - 41 populations
Kidneys (DR, LR, White) - 155 lines	Kidneys (DR, LR, White) – 119 populations
Yellow - 16 lines	Yellow – 13 populations

F1 populations: 541 different crosses among ten contrasting seed types.

2015 DRY BEAN YIELD TRIALS

EXPERIMENT	TITLE	PLANTING DATE	LOCATION		ENTRIES	DESIGN	REPS	HARVEST METHOD
5101	STANDARD NAVY BEAN YIELD TRIAL	06/04/15	SVR&EC	FRANKENMUTH	42	REC. LATTICE	4	DIRECT HARVESTED
5102	STANDARD BLACK BEAN YIELD TRIAL	06/04/15	SVR&EC	FRANKENMUTH	30	REC. LATTICE	4	DIRECT HARVESTED
5103	PRELIMINARY NAVY BEAN YIELD TRIAL	06/04/15	SVR&EC	FRANKENMUTH	56	REC. LATTICE	3	DIRECT HARVESTED
5104	PRELIMINARY BLACK BEAN YIELD TRIAL	06/04/15	SVR&EC	FRANKENMUTH	72	REC. LATTICE	3	DIRECT HARVESTED
5105	STANDARD GN & PINTO YIELD TRIAL	06/04/15	SVR&EC	FRANKENMUTH	42	REC. LATTICE	4	DIRECT HARVESTED
5106	STANDARD PINK & SMALL RED YIELD TRIAL	06/04/15	SVR&EC	FRANKENMUTH	20	REC. LATTICE	4	DIRECT HARVESTED
5107	PRELIMINARY PINK&SMALL RED YLD TRIAL	06/05/15	SVR&EC	FRANKENMUTH	48	ALPHA LATTICE	3	DIRECT HARVESTED
5108	MIDWEST & CO-OP. REGIONAL TRIAL	06/05/15	SVR&EC	FRANKENMUTH	48	ALPHA LATTICE	3	DIRECT HARVESTED
5209	STANDARD ANDEAN YIELD TRIAL	06/10/15	ENTRICAN	MONTCALM	56	REC. LATTICE	4	ROD PULLED
5210	NATIONAL WHITE MOLD YIELD TRIAL	06/10/15	ENTRICAN	MONTCALM	64	SQ. LATTICE	3	DIRECT HARVESTED
5111	NATIONAL DRY BEAN DROUGHT TRIAL	06/05/15	SVR&EC	FRANKENMUTH	24	ALPHA LATTICE	3	DIRECT HARVESTED
5212	BNF ANDEAN YIELD TRIAL	06/10/15	ENTRICAN	MONTCALM	9	RCBD	3	HAND PULLED

SVR&EC: SAGINAW VALLEY RESEARCH & EXTENSION CENTER

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.

FRANKENMUTH:FERTILIZER BROADCAST: 400 POUNDS OF 15-5-13 + S, ZN, MN, CU PRIOR TO PLANTING.
HERBICIDES APPLIED: 1.0 PT DUAL + 1.5 QT. EPTAM APPLIED PPI. 4 OZ. RAPTOR/1 PT REFLEX/1 PT BASAGRAN ON 7/10/15.

ENTRICAN: FERTILIZER BROADCAST: 200 POUNDS OF 19-10-19 PRIOR TO PLANTING. 50 POUNDS 46-0-0 SIDE DRESSED ON JULY 6.
HERBICIDES APPLIED: 2 PT. SONALAN/1.25 QT EPTAM/2PT. DUAL PPI. 4 OZ. RAPTOR/1 PT REFLEX/1 PT BASAGRAN ON 7/06/15.
PESTICIDES APPLIED: 9 OZ. ASANA ON JULY 6.
IRRIGATION APPLIED: 5.85 INCHES ON WHITE MOLD TRIALS - 9 APPLICATIONS; 2.4 INCHES ON STANDARD YIELD TRIALS - 4 APPLICATIONS

EXPERIMENT 5101 STANDARD NAVY YIELD TRIAL								PLANTED: 6/4/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
N14229	N11275/N11256	29	28.7	17.2	46.0	96	1.0	50.0	5.3	1.8
N14218	N11256/N11298	23	27.5	18.4	46.0	98	1.0	50.5	5.3	2.0
N13142	N08007/N09046	6	26.1	18.3	46.0	96	1.0	49.8	4.0	1.8
N14243	N11284/N11277	31	26.1	17.3	46.0	93	1.0	48.5	4.3	2.8
N14230	N11275/N11256	20	25.7	17.4	46.0	95	1.3	49.8	5.0	1.5
N12457	B09174/N09056	8	25.5	18.7	45.0	94	1.0	48.0	3.8	2.0
N14201	N11249/N11256	32	25.1	18.2	46.0	97	1.0	52.0	5.5	1.3
N11283	MEDALIST/N08003, **ALPENA**	9	24.7	19.1	45.0	98	1.3	50.5	4.3	2.5
I11264	COOP 03019, **MERLIN**	13	24.3	19.1	45.0	99	1.8	50.0	3.3	4.0
N12447	B09174/N09056	4	24.3	19.8	46.0	98	1.3	49.5	4.0	1.8
N13131	N09175/N08007	1	23.6	19.2	45.0	94	1.0	48.3	4.3	2.3
N14247	B11343/B11271	16	23.2	17.6	46.0	94	1.0	49.3	4.3	1.8
N13120	N08003/N05324	3	23.2	20.4	45.0	94	1.0	49.0	5.0	2.0
N14210	N11256/N11262	37	23.1	21.3	46.0	94	1.0	48.0	3.8	3.8
N14215	N11256/N11292	22	23.0	16.3	45.0	96	1.0	47.8	3.5	2.8
N14225	N11257/N11280	40	23.0	20.1	45.0	93	1.0	48.3	3.8	3.8
N12454	B09174/N09056	7	22.9	19.2	45.0	95	1.0	48.8	3.3	2.5
I15627	ISB2884-4	18	22.7	24.1	44.0	98	1.0	49.0	3.0	3.8
N14216	N11256/N11292	33	21.9	17.4	45.0	95	1.0	48.5	4.0	2.5
N14206	N11256/N11258	30	21.7	18.7	45.0	98	1.0	48.3	3.5	2.3
I15621	**MIST**	11	21.7	21.1	45.0	110	1.5	49.5	3.0	1.3
N14238	Alpena/N11249	26	21.6	18.4	45.0	93	1.0	48.3	3.5	3.5
N14205	N11256/N11258	34	21.4	19.4	45.0	96	1.0	48.0	3.5	3.3
N14240	Alpena/N11264	27	21.3	19.3	46.0	93	1.0	47.3	3.5	3.3
N14202	N11249/N11256	24	21.3	21.1	45.0	98	1.0	51.3	3.5	3.0
N14208	N11256/N11262	28	21.1	20.0	45.0	93	1.0	47.0	3.8	2.8
N13139	N05324/MEDALIST	5	20.9	18.6	46.0	96	1.5	49.0	3.3	3.5
N14223	N11257/N11256	25	20.5	17.9	45.0	100	1.3	53.0	4.5	2.3
N13135	N10102/N09046	17	20.0	19.0	45.0	94	1.0	48.0	3.8	3.8
N11264	N08003/MEDALIST	2	19.4	19.7	45.0	95	1.3	47.3	3.3	3.5

EXPERIMENT 5101 STANDARD NAVY YIELD TRIAL								PLANTED: 6/4/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
N14221	N11257/N11249	35	19.0	20.8	46.0	105	1.0	50.0	3.3	2.8
I15628	**LIGHTHOUSE**	12	18.8	21.2	45.0	109	1.5	50.0	3.0	1.0
N14231	N11275/N11264	21	18.2	20.7	45.0	94	1.3	48.8	3.3	4.0
N14224	N11257/N11280	36	17.7	19.0	45.0	95	1.0	48.5	3.3	4.8
I08902	**HYLAND T9905**	10	16.8	21.7	45.0	110	1.8	50.8	3.0	3.3
I15614	IG-10M	41	16.6	22.2	39.0	92	1.0	46.3	3.0	4.0
I14502	**FATHOM**	38	16.2	21.2	39.0	108	2.0	50.3	3.0	2.3
N14219	N11257/N11249	39	16.0	18.2	46.0	95	1.0	48.3	3.3	3.5
N13140	N05324/MEDALIST	14	15.7	18.4	46.0	98	1.3	48.5	3.0	4.3
I15625	ND070612	42	15.0	20.1	45.0	105	2.0	51.3	3.0	3.3
I08958	Mayflower/Avanti, **MEDALIST**	15	14.6	22.4	46.0	106	2.0	51.8	3.0	3.0
I15629	ISB96-3156	19	14.6	22.2	38.0	91	1.0	43.8	3.0	4.0
MEAN (42)			21.3	19.5	44.6	97.3	1.2	49.0	3.7	2.8
LSD (.05)			3.7	1.0	0.6	2.7	0.3	1.5	0.8	0.8
CV (%)			14.9	4.5	0.9	2.3	22.9	2.5	17.4	25.6

EXPERIMENT 5102 STANDARD BLACK YIELD TRIAL								PLANTED: 6/4/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
B13220	B09175/TARS-MST1	9	31.3	19.8	44.0	94	1.0	49.0	4.8	1.0
B13204	B09174/VCW54-1	8	30.1	24.7	45.0	96	1.0	49.3	5.3	1.5
B13225	PR0443-151/B09175	6	29.9	22.3	45.0	98	1.0	49.3	4.8	2.3
B14303	B09197/B11334	22	29.7	18.9	45.0	96	1.0	51.0	5.8	1.0
B14302	B09197/B11334	20	28.2	18.2	45.0	97	1.0	51.3	5.8	1.0
B13218	B09175/I09215	2	27.2	25.5	45.0	97	1.0	49.3	5.0	1.8
B13223	PR0443-151/B09175	5	27.0	22.6	45.0	97	1.3	47.8	3.8	3.0
B11363	B04644/B07554	4	26.6	21.5	45.0	95	1.0	47.8	4.3	3.8
B14309	B11338/B10222	26	26.4	18.2	45.0	96	1.3	49.3	3.5	1.8
B12720	B09175/Eclipse	1	26.1	23.1	45.0	94	1.0	47.3	4.5	3.5
B14307	B11271/B11343	23	25.4	23.5	46.0	98	1.5	54.8	4.3	3.0
B14311	B11338/B10241	19	24.2	18.7	45.0	96	1.0	48.3	5.0	1.0
B14308	B11301/B10222	25	23.4	19.5	45.0	96	1.0	49.5	4.3	2.8
B10244	B04644/ZORRO, **ZENITH**	18	23.3	22.4	44.0	96	1.0	50.5	4.8	4.3
I13419	NDF09304	29	22.7	16.4	45.0	94	1.0	48.5	3.8	4.3
B11311	B04587//ZORRO/DPC-1	13	22.6	19.5	46.0	96	1.3	47.5	4.0	2.3
B11555	I82054/B07554	21	22.5	23.3	45.0	100	1.5	49.5	3.5	3.0
B14313	B11343/B09196	27	22.3	16.9	45.0	93	1.0	45.5	3.8	4.5
I03390	ND9902621-2, **ECLIPSE**	12	22.1	19.6	45.0	95	1.0	48.0	4.3	3.8
B12724	B09184/B09135	3	22.0	21.2	45.0	101	1.0	49.3	3.5	1.8
B12711	B07554//Jaguar/B07554	16	21.8	20.3	45.0	94	1.0	47.0	4.0	5.0
I07116	T-39/Midnight, **SHANIA**	10	21.3	20.0	46.0	102	1.5	51.0	3.5	3.3
B14312	B11343/B09196	28	21.0	15.4	45.0	93	1.0	45.0	3.5	4.0
B11364	B04644/B07554	15	20.9	20.7	45.0	93	1.0	46.5	3.3	5.0
B14310	B11338/B10241	24	20.4	17.9	45.0	95	1.0	45.5	4.0	1.8
B11312	B04587//B05070/B05044	17	20.0	18.8	45.0	97	1.0	48.3	3.3	3.8
B12712	B07554//Jaguar/B07554	11	19.2	21.1	45.0	93	1.0	45.0	3.0	4.8
B12715	Zorro/N09056	7	19.2	19.4	45.0	94	1.0	45.3	3.0	3.3
B04554	B00103*/X00822, **ZORRO**	14	18.4	19.4	45.0	97	1.0	50.3	4.3	4.3
I81066	SEL-BTS,**T-39**	30	18.3	19.6	46.0	97	2.0	48.3	2.3	4.8
MEAN (30)			23.8	20.3	44.9	95.8	1.1	48.5	4.1	3.0
LSD (.05)			3.5	1.1	0.7	1.7	0.3	1.5	0.6	0.7
CV (%)			12.6	4.5	0.9	1.5	22.0	2.7	13.4	18.8

EXPERIMENT 5103 PRELIMINARY NAVY YIELD TRIAL								PLANTED: 6/4/15		
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE	CBB (1-5)
N15331	N12438/N12468	31	31.1	19.6	45.0	96	1.0	49.0	4.3	2.3
N15343	N11227/X12519	43	29.8	19.7	45.0	96	1.0	49.3	4.7	2.3
N15318	N11277/N09034	18	29.1	20.0	45.0	96	2.0	50.7	5.0	3.0
N15341	N12468/N12466	41	28.4	17.6	45.0	94	1.0	50.0	5.7	2.0
N15345	N11258/X12508	45	28.3	21.7	45.0	99	1.0	52.7	4.7	3.0
N15334	N12442/N11277	34	27.8	24.8	45.0	102	1.0	54.7	4.0	2.3
N15330	N12438/N11258	30	27.2	20.3	45.0	100	1.3	49.0	3.3	4.0
N15335	N12453/N11277	35	26.4	17.1	45.0	93	1.0	46.3	4.7	2.0
N15339	N12468/N11292	39	26.3	17.4	45.0	97	1.0	47.0	4.0	1.3
N15321	N11277/N11258	21	25.8	18.6	45.0	93	1.0	48.3	4.0	4.0
N15306	N11230/N11298	6	25.2	19.9	46.0	98	1.0	48.3	3.7	3.3
N15338	N12466/N11258	38	25.1	16.1	45.0	93	1.3	50.0	4.3	3.7
N15301	N09034/N11292	1	24.5	16.7	45.0	92	1.0	47.7	4.0	4.3
N15329	N12438/N11258	29	24.5	19.9	45.0	98	2.0	51.0	3.3	3.0
N15346	X12501/X12518	46	24.3	18.1	45.0	93	1.0	47.0	4.0	3.7
N15336	N12466/N11238	36	24.2	17.0	45.0	94	1.0	50.0	5.3	3.3
N15344	N11227/X11537	44	24.1	19.3	45.0	93	1.3	47.0	3.3	3.0
N15313	N11258/N11277	13	23.7	16.4	45.0	93	1.0	50.0	5.3	3.7
N15319	N11277/N09034	19	23.7	19.9	46.0	98	1.3	50.0	4.3	1.0
N11283	MEDALIST/N08003, **ALPENA**	54	23.5	19.2	45.0	96	1.3	50.3	4.7	2.7
N15323	N12405/N12468	23	23.4	18.0	44.0	94	1.0	48.0	4.7	2.7
N15332	N12438/N12468	32	23.3	20.8	45.0	101	1.0	49.0	3.3	3.7
N15326	N12405/N12468	26	23.1	16.7	45.0	94	1.0	45.7	4.3	1.0
N15307	N11238/N11258	7	23.0	15.4	45.0	97	1.0	51.0	4.7	1.7
N15322	N12405/N11238	22	22.9	19.0	45.0	94	1.0	46.0	4.0	3.7
N15337	N12466/N11258	37	22.3	17.3	46.0	94	1.0	47.7	4.3	3.3
I15616	PR0806-80A	55	22.0	21.2	45.0	99	1.0	49.7	4.0	2.7
N15320	N11277/N11258	20	21.6	18.3	45.0	93	1.0	48.3	4.0	3.3
N15328	N12405/N12468	28	21.6	19.3	45.0	96	1.0	49.3	5.0	3.7
N15340	N12468/N11298	40	21.6	22.7	46.0	99	1.0	50.7	4.7	1.7

EXPERIMENT 5103 PRELIMINARY NAVY YIELD TRIAL								PLANTED: 6/4/15		
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE	CBB (1-5)
N15342	X12507/X12519	42	21.5	19.8	46.0	96	1.0	49.7	3.0	4.3
N15309	N11258/N11277	9	21.2	17.4	45.0	94	1.0	47.0	4.3	3.3
N15314	N11258/N12405	14	21.1	20.0	45.0	93	1.0	46.3	4.3	3.3
N15315	N11258/N12405	15	20.8	17.9	45.0	93	1.0	44.0	3.7	4.3
N15303	N11230/N11277	3	20.5	15.8	45.0	94	1.0	46.3	3.3	4.0
N15324	N12405/N12468	24	20.3	16.9	45.0	93	1.0	44.0	3.0	4.7
N15308	N11258/N11238	8	20.2	17.1	45.0	99	1.0	50.0	3.0	3.3
N15312	N11258/N11277	12	20.0	16.3	45.0	93	1.0	46.3	3.7	3.7
N15302	N11230/N11277	2	19.4	17.7	45.0	99	1.0	52.7	4.7	2.3
N15333	N12442/N11277	33	18.9	22.5	46.0	97	1.3	51.3	4.7	2.3
N15305	N11230/N11298	5	18.8	19.6	45.0	98	1.0	48.0	3.3	4.0
N15310	N11258/N11277	10	18.7	17.7	45.0	94	1.0	50.0	4.0	3.7
N15347	Alpena*/B09197	47	18.5	21.3	45.0	101	1.0	49.0	3.0	3.3
N15316	N11258/N12405	16	18.2	21.2	45.0	93	1.0	45.3	4.0	3.7
N15304	N11230/N11298	4	18.0	18.6	45.0	97	1.0	47.7	3.3	3.7
N15327	N12405/N12468	27	17.7	19.9	45.0	94	1.0	46.3	4.0	4.0
N15350	Alpena*/B09197	50	17.5	19.1	45.0	93	1.0	47.3	3.0	4.7
I11264	COOP 03019, **MERLIN**	53	17.3	20.4	45.0	99	1.0	48.3	3.0	4.7
N15351	Alpena*/B09197	51	17.2	17.3	45.0	93	1.0	46.3	3.0	4.7
I15617	PR0806-81A	56	17.2	21.2	45.0	95	1.7	48.0	3.0	4.7
N15348	Alpena*/B09197	48	17.1	18.7	45.0	100	1.3	49.0	3.3	3.0
N15325	N12405/N12468	25	17.0	18.6	45.0	93	1.0	45.7	4.0	4.3
I08958	Mayflower/Avanti, **MEDALIST**	52	16.5	19.7	45.0	102	1.3	50.0	3.0	3.7
N15311	N11258/N11277	11	14.7	16.8	44.0	98	1.0	49.3	4.3	3.0
N15317	N11258/N12405	17	14.6	19.0	44.0	93	1.0	45.7	4.0	5.0
N15349	Alpena*/B09197	49	13.8	19.4	45.0	99	1.0	48.3	3.0	3.7
MEAN (56)			21.9	18.9	44.9	95.8	1.1	48.5	4.0	3.3
LSD (.05)			3.7	1.2	0.9	2.8	0.3	2.4	1.0	1.0
CV (%)			12.3	4.5	1.2	2.1	20.7	3.7	18.3	21.9

EXPERIMENT 5104 PRELIMINARY BLACK YIELD TRIAL								PLANTED: 6/4/15		
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE	CBB (1-5)
B15428	Zenith/B12721	28	36.6	26.7	44.0	95	1.0	50.0	5.3	2.0
B15408	B09175/B10215	8	36.1	23.8	46.0	96	1.0	48.0	5.0	2.3
B15442	B11363/B09175	42	36.1	26.7	45.0	98	1.0	48.3	4.3	2.7
B15418	B10208/B09175	18	35.8	26.1	45.0	96	1.0	49.7	4.3	1.7
B15407	B09175/B10215	7	34.5	24.4	45.0	97	1.3	48.7	4.0	2.7
B15441	B11343/B10213	41	34.4	22.8	45.0	93	1.0	45.3	4.7	3.0
B15416	B10208/B09175	16	34.1	28.5	45.0	97	1.3	48.0	4.0	2.3
B15451	B11371/B11363	51	34.1	22.8	46.0	97	1.0	50.3	5.0	2.0
B15430	Zenith/B12721	30	33.9	26.4	44.0	93	1.0	49.0	5.7	1.7
B15449	B11371/B09175	49	33.9	22.8	45.0	94	1.0	46.3	4.3	1.7
B15452	B11371/B11363	52	33.8	22.0	46.0	98	1.3	50.7	4.7	2.0
B15406	B09175/B10215	6	33.8	24.4	45.0	95	1.0	47.3	4.7	2.7
B15433	Zenith/B12721	33	33.7	26.2	45.0	96	1.0	50.0	4.0	2.0
B15453	B11371/B11363	53	33.5	23.4	46.0	95	1.0	49.0	5.0	2.0
B15425	Zenith/B10215	25	33.5	24.0	46.0	96	1.3	47.3	4.0	2.3
B15431	Zenith/B12721	31	33.5	26.0	44.0	93	1.0	47.3	4.7	2.7
B15412	B09175/B11363	12	33.3	22.0	45.0	93	1.0	46.3	5.0	3.7
B15434	Zenith/B12721	34	33.2	24.3	45.0	95	1.0	48.3	5.0	2.3
B15435	Zenith/B12721	35	33.1	24.8	45.0	94	1.0	46.0	4.7	2.3
B15414	B09175/B11611	14	33.1	27.8	45.0	95	1.0	48.0	4.0	2.7
B15421	B10208/B11611	21	32.8	23.8	45.0	95	1.0	46.7	4.7	2.0
B15410	B09175/B11343	10	32.8	22.5	46.0	95	1.0	47.3	4.0	3.0
B15427	Zenith/B11343	27	32.8	26.1	45.0	93	1.0	47.0	4.7	3.3
B15438	B11334/Zenith	38	32.7	22.7	46.0	94	1.0	48.3	4.7	3.0
B15417	B10208/B09175	17	32.6	22.6	45.0	95	1.0	47.3	4.0	2.0
B15415	B09175/B11611	15	32.5	26.0	45.0	95	1.0	46.3	3.7	3.0
B15432	Zenith/B12721	32	32.2	26.6	45.0	94	1.0	48.3	5.3	3.0
B15439	B11334/Zenith	39	32.1	22.3	46.0	94	1.0	47.0	4.3	2.7
B15464	B12709/B12721	64	31.9	26.7	46.0	96	1.0	48.7	5.3	2.0
B15454	B11561/B11343	54	31.8	23.7	45.0	94	1.0	47.3	3.7	3.0
B15419	B10208/B09175	19	31.8	25.2	45.0	100	1.0	49.7	4.0	1.3
B15443	B11363/B09175	43	31.7	26.5	45.0	95	1.0	46.0	4.3	2.7
B15404	B09175/Zorro	4	31.2	23.4	45.0	94	1.0	45.0	4.7	3.0
B10244	B04644/ZORRO, **ZENITH**	72	31.1	24.3	45.0	96	1.0	48.0	4.3	3.0
B15469	Zenith/X11530	69	30.8	21.9	46.0	96	1.0	48.3	3.7	2.7
B15465	B12709/B12721	65	30.8	24.9	45.0	95	1.0	46.0	4.3	3.0
B15447	B11363/Zenith	47	30.7	23.3	45.0	93	1.3	45.3	4.3	3.7
B15411	B09175/B11363	11	30.5	21.9	45.0	94	1.0	45.3	4.7	2.3
B15426	Zenith/B11343	26	30.5	22.1	45.0	97	1.0	49.7	4.3	2.3
B15470	Alpena*/B09197	70	30.5	23.7	45.0	93	1.0	45.7	3.7	4.0

EXPERIMENT 5104 PRELIMINARY BLACK			YIELD					PLANTED: 6/4/15		
NAME	PEDIGREE	ENTRY	CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE	CBB (1-5)
B15409	B09175/B11343	9	30.3	20.4	46.0	94	1.0	47.3	4.3	3.7
B15457	B11594/Zenith	57	30.3	23.9	46.0	95	1.0	46.7	4.0	3.0
B15429	Zenith/B12721	29	30.2	25.4	46.0	94	1.0	46.7	4.7	2.3
B15420	B10208/B11611	20	30.0	23.7	44.0	98	1.0	49.0	4.0	1.3
B15402	Zorro/B11343	2	29.7	22.6	46.0	94	1.0	46.7	4.0	3.0
B15422	B10208/B12721	22	29.7	24.2	44.0	95	1.0	47.0	5.0	1.0
B15448	B11363/B11345	48	29.5	23.6	46.0	94	1.0	48.0	4.0	3.0
B15413	B09175/B11363	13	28.9	22.2	45.0	93	1.0	46.3	4.7	2.7
B15444	B11363/B09197	44	28.8	21.3	45.0	94	1.0	47.0	4.7	2.3
B15403	Zorro/B11343	3	28.7	21.8	45.0	96	1.0	47.3	4.7	2.7
B15405	B09175/B10215	5	28.6	22.6	45.0	94	1.0	45.7	4.0	3.0
B15450	B11371/Zenith	50	28.6	21.0	46.0	94	1.0	48.7	4.3	3.7
B15466	B12709/B12721	66	28.4	26.9	45.0	94	1.0	46.0	4.3	3.7
B15463	B12707/B11311	63	28.2	20.5	46.0	98	1.3	49.7	4.3	1.3
B15440	B11343/B10213	40	28.1	21.4	45.0	93	1.0	44.0	4.3	3.3
B15458	B11594/B11343	58	28.0	22.8	45.0	98	1.3	48.7	4.0	3.0
B15446	B11363/Zenith	46	27.8	23.8	45.0	96	1.0	47.7	3.7	2.7
B15436	B11312/Zenith	36	27.5	23.2	45.0	95	1.0	47.3	4.7	3.3
B15445	B11363/Zenith	45	27.4	23.7	45.0	95	1.0	47.0	4.0	3.3
B15462	B12707/B11311	62	27.3	20.6	45.0	97	1.0	48.3	4.0	1.7
B15401	Zorro/B11312	1	27.2	19.7	45.0	94	1.0	46.7	4.0	3.7
B15455	B11561/B11343	55	26.9	22.9	44.0	93	1.0	43.7	4.3	3.0
B15456	B11594/Zenith	56	25.9	23.4	44.0	95	1.0	47.3	4.3	3.0
B15423	B10215/Zenith	23	25.7	25.0	46.0	95	1.0	46.7	3.7	4.0
B04554	B00103*/X00822, **ZORRO**	71	25.4	19.1	45.0	98	1.0	49.7	4.3	3.0
B15461	B11611/B11343	61	24.8	25.1	46.0	97	1.0	46.3	3.0	3.3
B15460	B11611/B11343	60	24.7	21.0	44.0	93	1.0	44.0	3.7	3.3
B15467	Zenith/X11528	67	24.6	21.8	45.0	92	1.0	44.7	3.7	3.7
B15437	B11312/Zenith	37	24.2	21.7	45.0	94	1.3	46.7	4.0	3.7
B15424	B10215/Zenith	24	22.9	22.0	46.0	96	1.0	45.3	3.3	4.3
B15468	Zenith/X11530	68	20.1	20.6	46.0	93	1.0	43.0	3.0	4.0
B15459	B11611/Zenith	59	16.4	21.3	46.0	92	1.0	42.7	3.0	5.0
MEAN (72)			30.3	23.5	44.9	94.9	1.0	47.2	4.3	2.8
LSD (.05)			3.8	1.5	1.1	2.0	0.3	2.3	0.8	1.1
CV (%)			9.2	4.8	1.4	1.6	18.7	3.6	14.3	28.7

EXPERIMENT 5105 STANDARD GREAT NORTHERN AND PINTO YIELD TRIAL								PLANTED: 6/4/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
P07863	AN-37/P02630, **ELDORADO**	30	24.7	43.2	42.0	97	2.0	54.0	5.0	3.3
G12901	G07321/Fuji, **SAMURAI**	2	24.4	26.2	45.0	97	1.0	52.0	5.0	4.0
G14510	G11471/G11469	18	23.5	30.4	46.0	97	2.0	50.5	4.5	2.3
G14506	G11469/G11417	17	23.4	34.4	46.0	95	2.0	50.0	5.0	3.3
I07113	PNE-6-94-75/Kodiak, **LAPAZ**	37	22.4	37.9	45.0	94	1.5	51.0	4.5	3.3
I14509	PT11-13	42	21.8	37.0	44.0	91	2.0	47.0	4.0	4.0
P14815	P08522/LONG'S PEAK	32	21.7	37.4	45.0	93	1.5	49.5	5.5	3.0
G14530	P11518/G11405	4	21.5	37.6	47.0	99	2.0	55.0	3.5	2.3
P14814	P08522/LONG'S PEAK	31	21.2	38.7	47.0	94	2.0	51.5	4.5	3.7
G14505	G11429/P08175	20	21.0	27.0	44.0	94	2.0	49.0	4.0	3.3
G14503	G11404/G11469	21	20.9	41.3	44.0	95	2.0	49.5	4.0	3.0
G13468	G08259//Eldorado/G08210	6	20.6	32.5	45.0	95	1.5	49.0	5.0	3.0
P11519	SANTA FE/P07806	38	20.3	39.9	47.0	96	1.5	56.5	4.5	2.3
G14525	P09425/G11429	25	19.7	42.2	45.0	94	1.5	47.5	4.5	3.0
P14802	P08162/P11518	35	19.7	37.8	47.0	92	1.5	49.0	4.5	2.7
G11440	G07309/P08401	11	19.3	33.0	44.0	93	1.5	48.5	5.0	3.0
P14812	P09425/P08161	34	19.3	36.7	45.0	91	1.0	47.0	4.0	3.0
G11438	G07309/P08401	10	19.2	35.5	43.0	93	1.0	50.0	4.5	3.3
P13701	G09305/Eldorado	40	19.1	39.8	44.0	93	1.5	48.5	4.5	2.3
G13444	G07302//G08274/P08410	3	19.1	36.6	42.0	93	1.0	49.0	5.0	2.3
G13479	Eldorado/G09312	1	18.8	30.2	42.0	94	1.0	48.5	4.5	2.7
P11523	P04203/P06125	41	18.5	38.2	45.0	93	1.0	49.5	5.0	2.7
G13456	G08217//P08372/P08410	13	18.4	29.4	44.0	92	1.0	45.5	5.0	3.3
P14811	P08403/G11405	33	18.1	34.8	41.0	93	1.0	47.5	4.5	3.0
P14806	P08162/P11518	39	17.9	36.3	46.0	92	2.0	49.5	3.0	3.3
I14519	23ST-27	28	17.7	32.8	44.0	91	2.0	43.5	3.0	4.3
G14523	P08403/G11405	22	17.7	41.2	40.0	93	1.0	47.5	4.0	2.3
P14804	P08162/P11518	36	17.6	32.4	45.0	92	2.0	48.0	4.0	4.0
G14513	G11402/Powderhorn	26	17.1	33.7	44.0	93	1.0	48.5	4.5	3.3
G14507	G09329/G10412	19	16.9	25.2	45.0	95	1.5	48.5	4.0	3.0

EXPERIMENT 5105 STANDARD GREAT NORTHERN AND PINTO YIELD TRIAL								PLANTED: 6/4/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
G14511	G11417/G11404	27	16.8	34.8	39.0	94	1.5	48.5	4.0	2.7
G11463	G07309//G04207/I07130	7	16.7	39.0	45.0	95	2.0	48.5	3.5	3.7
G13450	G08217//P08372/P08410	9	16.6	31.8	45.0	93	1.0	47.5	5.0	3.7
G14519	P08162/G11404	23	16.1	37.6	42.0	94	1.5	49.5	3.5	3.3
G14520	P08369/G09303	24	15.4	27.9	45.0	94	1.0	49.5	4.0	3.7
G14509	G11404/Eldorado	16	15.3	33.4	44.0	93	2.0	48.5	4.0	3.7
G13412	Powderhorn//G09301/Eldorado	8	15.1	34.4	45.0	94	1.0	48.0	4.5	2.7
G13423	Powderhorn//Eldorado/G09312	5	15.0	34.3	45.0	95	1.5	50.5	5.0	2.7
G08254	G04514/Matterhorn, **POWDERHORN**	15	14.4	34.0	43.0	92	1.0	47.0	4.0	3.7
G13452	G08217//P08372/P08410	12	13.6	30.5	41.0	91	1.0	45.5	4.5	3.7
G93414	**MATTERHORN**	14	11.9	32.3	44.0	91	2.0	47.0	4.0	3.3
I14520	SF103-8	29	10.2	32.8	39.0	95	2.0	52.0	2.5	3.7
MEAN (42)			18.5	34.8	43.8	93.4	1.5	49.1	4.3	3.2
LSD (.05)			2.9	3.0	2.2	1.9	0.6	1.8	1.0	0.9
CV (%)			13.5	7.5	3.0	1.2	25.4	2.1	13.5	22.1

EXPERIMENT 5106 STANDARD RED AND PINK YIELD TRIAL								PLANTED: 6/4/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
I13401	SR 09303, **VIPER**	2	32.4	30.2	46.0	101	1.3	51.5	4.3	3.0
I13446	SR 09304, **RUBY**	19	29.4	34.4	45.0	100	2.0	49.8	3.8	3.0
R13752	Merlot/SER48	3	29.0	40.7	45.0	96	1.0	51.3	5.0	3.0
R98026	R94037/R94161, **MERLOT**	13	27.1	40.4	45.0	99	2.0	52.0	4.0	3.0
R12844	SR9-5/R09508	5	26.7	34.4	45.0	95	1.5	48.8	4.5	2.0
R13848	Merlot/I11209	16	26.5	35.3	47.0	102	1.5	53.8	3.5	4.0
S08418	S02754/S04503, **ROSETTA**	6	26.0	36.2	45.0	98	1.5	52.5	5.0	3.0
R13821	Merlot/I11209	20	25.8	37.2	49.0	102	1.5	53.8	3.8	4.0
R12845	SR9-5/R09508	1	25.7	37.0	44.0	99	1.8	52.0	4.5	2.0
R13526	X10308/R08514	12	25.7	38.1	47.0	95	1.5	50.0	4.5	3.0
S14706	Rosetta/S11707	8	25.2	37.1	44.0	99	1.3	50.3	5.0	2.0
R12843	SR9-5/R09508	4	25.1	34.3	44.0	96	1.5	49.0	4.8	1.0
R13537	Merlot/X10316	9	24.2	35.0	46.0	98	1.8	51.3	4.3	3.0
R11801	X07712/X07721, **DESERT SONG**	18	23.8	32.9	43.0	94	2.3	45.0	4.0	3.0
S14707	Rosetta/S11707	15	22.2	32.4	44.0	96	1.3	48.5	4.3	2.0
S14702	S11707/S08419	7	22.1	35.2	44.0	97	1.0	50.3	4.5	4.0
R11806	X07714/X07710, **GYPSY ROSE**	17	21.7	32.0	48.0	101	2.3	49.0	4.0	3.0
S14704	S11707/S08419	11	21.7	36.8	46.0	101	1.0	50.0	4.5	2.0
S14708	Rosetta/S11707	14	21.3	32.7	44.0	98	1.0	50.0	4.5	1.0
S14703	S11707/S08419	10	19.7	34.1	44.0	97	1.3	50.3	4.3	3.0
MEAN (20)			25.1	35.3	45.1	98	1.5	50.4	4.3	2.7
LSD (.05)			2.8	1.7	1.2	2	0.5	1.6	0.5	(1 Rep)
CV (%)			9.4	4.1	1.5	1	28.2	2.6	10.4	

EXPERIMENT 5107 PRELIMINARY RED AND PINK YIELD TRIAL								PLANTED: 6/5/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
I13401	SR 09303, **VIPER**	45	36.9	31.3	45.0	102	1.7	52.0	4.0	3.0
I15602	PK12-3	35	31.4	37.7	48.0	100	3.0	44.3	3.0	3.0
I13446	SR 09304, **RUBY**	46	31.4	34.3	44.0	102	2.0	48.7	3.7	3.0
R15629	SR9-5/R09508, R12845-05	29	31.1	33.5	45.0	98	1.0	52.0	5.0	1.0
R12844	SR9-5/R09508	41	30.8	34.9	45.0	96	1.7	50.0	4.7	1.0
R15626	SR9-5/R09508, R12845-01	26	30.7	37.3	45.0	97	1.7	52.0	5.0	1.0
R12845	SR9-5/R09508	42	30.6	33.7	45.0	96	1.7	51.3	5.0	1.0
R15625	SR9-5/R09508, R12844-06	25	30.3	34.6	45.0	96	2.0	51.0	4.3	2.0
R15630	SR9-5/R09508, R12845-06	30	30.0	33.5	45.0	98	1.7	51.7	5.0	1.0
R15628	SR9-5/R09508, R12845-04	28	28.9	35.8	44.0	96	2.0	50.7	4.3	1.0
R15624	SR9-5/R09508, R12844-05	24	28.9	34.0	44.0	95	1.3	50.7	4.3	1.0
R13752	Merlot/SER48	48	28.4	40.5	45.0	97	1.0	50.7	5.0	3.0
R15620	SR9-5/R09508, R12844-01	20	28.4	35.2	44.0	94	2.0	49.0	4.0	1.0
R15610	Merlot//IBC301-204/R11633	10	28.2	33.1	49.0	103	3.0	45.0	3.0	3.0
R98026	R94037/R94161, **MERLOT**	43	27.9	39.9	45.0	99	2.0	50.7	3.7	2.0
R15622	SR9-5/R09508, R12844-03	22	27.7	36.3	45.0	99	2.0	52.0	4.0	1.0
R15609	Merlot//Dorado/R11615	9	27.4	44.3	46.0	99	1.3	53.3	4.7	3.0
I15605	SR10-2-1	38	26.6	39.3	43.0	94	2.0	47.7	4.3	3.0
R15623	SR9-5/R09508, R12844-04	23	26.1	35.7	44.0	95	2.0	50.7	4.3	1.0
R15627	SR9-5/R09508, R12845-03	27	26.1	35.7	45.0	99	2.0	52.0	4.3	1.0
R15612	Merlot//IBC301-204/R11633	12	25.9	34.5	46.0	96	2.0	49.7	4.3	3.0
S08418	S02754/S04503, **ROSETTA**	44	25.8	35.3	44.0	101	1.3	51.7	4.3	2.0
R15607	R11614/PS02-050-2	7	25.7	29.7	44.0	100	2.0	48.7	4.0	2.0
R15602	R11614/PS02-050-2	2	25.5	28.6	44.0	100	1.7	53.7	4.7	2.0
I13428	PK10-19-2	33	25.5	34.4	42.0	94	1.7	49.0	4.0	3.0
R15621	SR9-5/R09508, R12844-02	21	25.3	33.2	45.0	96	2.0	50.7	4.0	1.0
I15603	PK12-11-6-B	36	24.9	33.7	44.0	93	1.7	45.3	3.3	3.0
S14706	Rosetta/S11707	47	24.7	34.7	45.0	99	1.0	50.0	5.0	3.0
I15607	SR12-9	40	24.6	36.8	44.0	99	2.0	49.3	4.0	3.0
R15606	R11614/PS02-050-2	6	24.1	30.2	43.0	97	2.0	49.7	4.3	2.0
R15601	R11614/PS02-050-2	1	24.1	29.9	44.0	99	1.0	49.7	5.0	2.0
R15605	R11614/PS02-050-2	5	24.0	29.2	44.0	98	1.3	49.7	5.0	2.0
I15601	PK11-5-5-B2	34	23.6	27.2	40.0	93	2.0	48.7	3.3	4.0
R15611	Merlot//IBC301-204/R11633	11	23.5	31.6	46.0	94	2.0	49.0	4.0	2.0
I15606	SR10-20-7	39	23.5	27.7	44.0	93	1.0	47.0	4.0	3.0

EXPERIMENT 5107 PRELIMINARY RED AND PINK YIELD TRIAL								PLANTED: 6/5/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
R15613	Merlot//F07-449-9-3/R11633	13	23.4	34.4	47.0	104	1.3	54.3	3.3	3.0
R15615	R11610/PS02-050-2	15	23.2	26.1	44.0	93	1.7	46.3	4.3	3.0
R15614	Merlot//F07-014-22-2/R11633	14	23.2	32.0	48.0	99	1.3	51.3	4.0	3.0
R15603	R11614/PS02-050-2	3	22.9	26.4	44.0	96	1.7	48.0	4.7	2.0
I15604	SR10-2-4(1)	37	22.7	34.8	43.0	93	1.0	46.3	4.0	3.0
R15618	R11616/R12824	18	22.5	26.6	44.0	94	1.0	44.7	4.0	2.0
R15616	R11610/PS02-050-2	16	22.0	27.4	43.0	94	2.0	47.3	4.0	4.0
R15617	R11616/R12824	17	21.2	24.6	43.0	94	1.0	47.3	4.0	3.0
R15619	R11616/R12824	19	20.2	28.5	44.0	94	1.0	45.0	3.7	3.0
R15604	R11614/PS02-050-2	4	19.8	25.7	44.0	103	2.0	51.7	3.7	1.0
R15608	R11616/R12859	8	19.6	35.5	45.0	104	2.0	55.0	3.7	3.0
I13427	PK10-3-6	32	19.6	32.1	43.0	95	2.0	50.3	4.0	3.0
I09204	PK9-1	31	18.6	32.4	40.0	92	2.7	47.7	3.0	3.0
MEAN (48)			25.8	33.0	44.2	97.1	1.7	49.6	4.2	2.3
LSD (.05)			3.4	1.9	1.4	1.1	0.4	1.2	0.5	(1 Rep)
CV (%)			9.7	4.2	1.9	0.9	17.3	1.8	9.1	

EXPERIMENT 5108 MRPN/CDBN YIELD TRIAL								PLANTED: 6/5/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
I15647	CO 14790-3	5	32.8	43.6	44.0	105	1.7	53.0	4.0	3.0
I15652	ND121630	14	32.1	37.8	45.0	100	1.7	53.7	3.3	3.0
I15646	CO 92737	4	30.8	32.6	43.0	93	2.0	48.3	3.7	3.0
P07863	AN-37/P02630, **ELDORADO**	35	29.4	44.0	42.0	103	2.0	53.3	4.0	3.0
I14530	CO 86660-14	6	29.2	40.3	44.0	92	1.7	49.3	3.7	2.0
I11238	ND090713	13	28.8	36.6	43.0	94	1.0	48.0	4.3	3.0
I15633	PT 9-5-6	30	28.0	35.2	44.0	93	1.7	48.7	4.0	2.0
R11801	X07712/X07721, **DESERT SONG**	24	27.5	32.5	43.0	91	2.0	46.0	3.7	3.0
I15630	ISB13-796	23	27.5	41.0	44.0	94	2.0	49.7	3.3	2.0
P14815	P08522/LONG'S PEAK	20	27.4	36.7	44.0	92	1.0	50.0	6.0	3.0
I15648	CO 03184-13	8	26.8	36.5	43.0	92	1.0	47.7	3.0	1.0
I15650	CO 25069-2	10	26.2	35.2	43.0	90	2.0	48.0	3.3	2.0
R11806	X07714/X07710, **GYPSY ROSE**	25	25.6	35.3	47.0	105	2.7	49.0	3.3	3.0
I15639	UIP-40	37	25.3	38.4	46.0	103	1.3	51.0	4.0	3.0
I15645	COSD-44	43	24.9	37.5	43.0	92	2.0	48.0	3.0	2.0
I15649	CO 12776-4	9	24.9	35.8	44.0	91	2.0	47.0	3.3	3.0
I14519	23ST-27	44	24.5	38.8	44.0	91	2.0	45.3	3.3	3.0
I15644	COSD-35	42	24.4	38.6	44.0	96	2.0	48.3	3.0	2.0
I11244	CO 91216-15	7	24.0	39.7	43.0	92	1.3	48.7	3.3	2.0
I15655	NE4-14-14	17	23.9	40.9	45.0	102	2.0	48.3	3.0	3.0
I15640	UIP-46	38	23.9	41.1	44.0	95	1.3	50.3	3.7	4.0
G13444	G07302//G08274/P08410	21	23.6	33.9	43.0	94	1.0	48.3	4.7	3.0
I15635	ISB1173-1	32	23.2	44.7	40.0	94	2.0	48.7	3.0	2.0
I15651	ND121453	11	22.8	38.3	45.0	102	1.0	55.3	4.0	3.0
I15615	El Diablo FU	46	22.5	40.5	43.0	92	2.0	47.3	3.0	2.0
I15654	NE3-14-15	16	22.4	36.1	43.0	97	2.3	47.0	3.3	2.0
P14811	P08403/G11405	19	22.3	36.1	44.0	92	1.0	47.3	3.7	4.0
G12901	G07321/Fuji, **SAMURAI**	47	22.2	27.0	44.0	105	2.0	52.7	4.3	3.0
I15632	GN10-17-4	27	22.2	32.9	44.0	92	1.3	46.3	4.0	4.0
G08254	G04514/Matterhorn, **POWDERHORN**	28	21.7	31.8	44.0	92	1.0	48.7	4.7	3.0
I99117	**BUSTER**	1	21.5	36.6	43.0	90	2.3	43.0	3.0	1.0
I15636	ISB1231-1	33	21.0	42.9	38.0	91	2.7	47.3	2.7	3.0
I15638	UIP-35	36	20.7	32.8	45.0	96	2.0	48.3	3.3	4.0
I15642	COSD-7	40	20.5	43.1	43.0	97	2.0	49.0	3.3	2.0
G13479	Eldorado/G09312	22	20.2	30.3	39.0	92	1.0	48.3	5.0	3.0

EXPERIMENT 5108 MRPN/CDBN YIELD TRIAL								PLANTED: 6/5/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
I15656	NE4-14-53	18	20.0	39.0	43.0	95	2.3	45.7	3.0	2.0
I15641	COSD-3	39	18.9	36.4	44.0	94	2.0	48.3	3.0	3.0
I15643	COSD-25	41	18.6	41.9	44.0	94	2.0	48.3	3.0	2.0
I13450	CO 91212-4, **CENTENNIAL**	31	18.6	38.7	46.0	110	2.0	50.7	3.0	1.0
I15631	GN10-5-6	26	17.8	35.8	46.0	106	2.0	50.0	3.0	3.0
I10113	ND080412	12	16.8	32.3	44.0	100	2.0	49.7	3.3	3.0
I15653	NE1-14-5	15	16.5	33.5	43.0	92	2.3	46.3	3.0	3.0
G93414	**MATTERHORN**	2	16.2	33.4	43.0	91	2.0	46.0	3.0	3.0
I98313	CO51715, **MONTROSE**	3	16.2	38.5	44.0	90	3.0	30.0	1.7	3.0
C06808	I01800/C03129, **BELLAGIO**	48	16.0	39.8	42.0	98	2.0	50.0	4.3	2.0
I14520	SF103-8	45	13.6	32.7	38.0	100	2.3	48.7	2.7	3.0
I15637	ISB1259-60	34	12.3	39.0	37.0	89	1.0	47.3	2.7	3.0
I84002	NW410//VICTOR/AURORA, **OTHELLO**	29	7.8	39.9	37.0	88	2.7	40.0	2.0	4.0
MEAN (48)			22.6	37.2	42.9	95.5	1.8	48.1	3.5	2.7
LSD (.05)			3.9	2.0	1.5	3.5	0.5	1.7	0.6	(1 Rep)
CV (%)			12.7	4.0	2.0	2.7	18.4	2.6	13.5	

EXPERIMENT 5209 STANDARD ANDEAN YIELD TRIAL								PLANTED: 6/10/15		
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE	STAND (1-5)
I13421	ND061106, **ROSIE**	20	30.0	61.5	44.0	109	1.0	48.3	5.0	4.5
I15622	**DYNASTY**	54	28.0	71.8	43.0	109	1.0	47.5	4.8	3.0
I14513	DBY-28-1	10	27.1	49.9	47.0	103	1.0	45.8	4.8	2.8
K90902	BEA/50B1807//LASSEN, **BELUGA**	18	26.0	64.3	45.0	109	1.0	48.5	5.0	3.3
I13422	ACUG 10-W1, **YETI**	39	25.9	64.8	45.0	109	1.0	46.8	4.0	3.0
K15303	K11303/K11308	42	25.1	57.2	44.0	105	1.0	47.8	5.3	3.0
K15302	K11303/K11308	41	24.9	57.4	43.0	103	1.0	46.3	4.5	3.8
I15620	DRK 07323, **CHAPARRAL**	52	24.7	55.1	44.0	105	1.0	45.3	4.3	3.8
K15304	K11306/K11916	43	24.6	55.9	45.0	103	1.0	45.8	5.0	4.3
Y11405	FR-07-AZP-14-06	3	23.7	57.4	46.0	109	1.0	48.0	5.0	3.8
I11201	Pink Panther//ZAA/Montcalm, **CLOUSEAU**	8	23.2	74.8	44.0	106	1.0	46.3	4.0	3.3
I11233	OAC 07-L1, **OAC INFERNO**	38	23.1	69.9	45.0	109	1.0	48.8	4.8	3.3
I92014	**ETNA**	30	22.6	70.8	44.0	104	1.0	44.0	4.3	3.0
I10105	Montcalm/DRK15, **MAJESTY**	53	22.6	81.9	48.0	108	1.0	48.5	4.8	2.8
K15601	K11306/K11916	44	22.4	57.1	43.0	105	1.0	45.8	4.8	4.3
I15619	LRK 09351, **BIG RED**	51	21.4	68.4	44.0	106	1.0	46.5	4.0	3.3
K15901	K11714/K11914	45	20.6	63.6	44.0	104	1.0	45.3	4.8	3.5
I13420	ND061210, **TALON**	16	20.3	62.8	44.0	106	1.0	48.0	4.5	2.8
K90101	CHAR/2*MONT, **RED HAWK**	17	20.1	65.4	43.0	106	1.0	46.0	3.8	3.0
I15624	UCD 0908	56	19.4	63.5	45.0	111	1.0	48.3	4.0	3.5
C13411	CAPRI/I08969	31	19.3	59.7	44.0	103	1.0	44.8	4.8	3.5
K15906	K08961/K12811	50	19.3	71.5	43.0	104	1.0	46.3	4.5	3.3
K11709	K06012//K06014/K07715	4	18.4	59.9	44.0	104	1.0	44.3	4.3	3.0
I15623	UCD 0701	55	18.3	69.7	44.0	108	1.0	48.0	5.0	3.0
K11714	K08601/K08233	5	18.2	68.3	44.0	106	1.0	48.5	5.0	2.5
I90013	**CELRK**	12	17.1	70.9	44.0	103	1.0	44.5	3.8	2.3
K74002	MDRK/CN(3)-HBR(NEB#1), **MONTCALM**	19	16.9	68.2	45.0	110	1.0	47.5	3.8	2.3
I15626	ND122472	15	16.8	58.1	45.0	110	1.0	47.5	3.8	3.0
C13414	C08714/BELLAGIO	34	16.8	67.5	43.0	107	1.0	45.3	4.0	2.3
I14515	DBY-60-1	9	16.7	48.5	44.0	105	1.0	43.8	4.0	2.0
K15301	K11303/K11308	40	16.0	60.1	43.0	103	1.0	44.3	3.8	2.5
K08961	K04604/USDK-CBB-15, **SNOWDON**	11	15.8	70.2	43.0	103	1.0	45.5	4.3	2.5
C11373	C08706/C08712	32	15.6	62.7	42.0	101	1.0	43.8	4.3	3.5
K14101	K11911/K11304	28	15.5	67.6	44.0	102	1.0	45.3	4.3	2.3
C13410	CAPRI/I08969	35	15.4	58.8	44.0	105	1.0	43.3	4.0	2.5
K15904	K08961/K11909	48	15.4	58.6	43.0	102	1.0	42.8	3.8	2.8
K14814	Clouseau/K11308	23	15.2	58.9	44.0	105	1.0	46.3	4.0	2.0
K14805	Snowdon/Isabella	24	15.0	71.5	42.0	103	1.0	43.3	3.8	2.8
C13413	C07411/C08712	33	15.0	65.9	44.0	104	1.0	44.8	4.3	2.8
K15905	K08961/K11909	49	13.4	59.5	43.0	103	1.0	44.3	3.8	3.5

EXPERIMENT 5209 STANDARD ANDEAN YIELD TRIAL								PLANTED: 6/10/15		
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE	STAND (1-5)
K15903	K08961/K11909	47	12.9	59.9	41.0	102	1.0	43.5	3.8	3.0
K14807	Snowdon/Isabella	27	12.6	66.2	43.0	104	1.0	43.8	3.5	2.5
K11306	K06621/USDK-CBB-15	1	12.2	60.7	43.0	105	1.0	46.3	3.8	2.0
K13909	K07921//K08971/K08233	6	12.2	55.7	43.0	103	1.0	42.0	3.5	2.8
C13406	C08714//C08717/CAPRI	36	11.9	62.6	44.0	104	1.0	43.5	3.8	3.0
K13902	K06939/WALLACE//K08938	14	11.8	62.1	42.0	103	1.0	43.3	3.5	2.8
K14703	Isabella/Snowdon	22	11.7	60.8	42.0	103	1.0	42.8	3.5	2.5
C14504	C08714/I11269	29	11.5	51.2	41.0	102	1.0	42.0	3.3	3.3
C11269	C07401//CBB-20/C05653	37	11.5	63.7	42.0	103	1.0	43.5	3.8	2.0
K14104	K08222/K11803	25	11.3	63.4	43.0	106	1.0	44.8	3.8	1.8
K14803	K10902//K08920/K10902	26	10.5	63.6	45.0	104	1.0	44.0	3.5	1.5
K15902	K12811/K08961	46	10.4	58.3	43.0	100	1.0	41.8	3.3	3.3
K11919	K04607/USWK-CBB-17	7	9.6	50.6	42.0	100	1.0	42.0	2.8	3.0
K12803	K07921//K08971/K08233	13	9.6	59.8	44.0	102	1.0	42.0	3.0	2.5
K14810	K11907/K11304	21	8.9	52.0	43.0	104	1.0	44.0	3.8	2.0
K13908	K07921//K08971/K08233	2	8.7	60.4	42.0	101	1.0	42.5	3.3	2.3
MEAN (56)			17.6	62.5	43.4	104.6	1.0	45.2	4.1	2.9
LSD (.05)			5.0	3.5	1.9	1.8	-	1.6	0.6	0.9
CV (%)			24.3	4.8	2.7	1.5	-	3.0	13.5	27.6

EXPERIMENT 5210 NATIONAL WHITE MOLD YIELD TRIAL									PLANTED: 6/10/15			
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE	WM (1-5)	WM %	STAND
P07863	AN-37/P02630, **ELDORADO**	57	34.7	45.7	48.0	110	1.0	52.3	5.0	2.0	22.2	4.0
B10244	B04644/ZORRO, **ZENITH**	43	30.7	23.7	50.0	109	1.0	50.0	5.7	1.3	14.8	4.3
I13446	SR 09304, **RUBY**	63	30.5	34.4	49.0	105	2.0	48.7	3.3	2.7	29.6	4.3
B14307	B11271/B11343	37	30.4	19.8	51.0	109	1.0	52.3	5.0	2.3	25.9	4.7
I13401	SR 09303, **VIPER**	54	30.4	33.1	48.0	108	1.3	49.0	4.0	1.7	18.5	4.7
G14506	G11469/G11417	48	29.9	33.8	49.0	104	1.3	49.7	5.3	2.0	22.2	3.7
B13204	B09174/VCW54-1	33	29.5	28.1	47.0	108	1.0	50.3	5.3	1.7	18.5	4.3
B13218	B09175/I09215	31	29.3	30.2	48.0	108	1.0	49.3	5.3	1.0	11.1	4.7
N13142	N08007/N09046	16	28.8	23.0	48.0	105	1.0	49.3	5.7	1.3	14.8	5.0
B14311	B11338/B10241	35	28.4	24.7	50.0	109	1.0	50.0	5.7	1.0	11.1	5.0
G14530	P11518/G11405	46	28.2	41.3	49.0	108	1.7	52.7	5.7	1.3	14.8	4.3
R13752	Merlot/SER48	1	28.1	42.1	48.0	106	1.3	49.3	4.3	1.3	14.8	3.7
I13445	039-A-5	3	27.6	41.1	48.0	107	1.0	49.3	4.3	1.3	14.8	3.0
B14308	B11301/B10222	39	27.5	22.8	51.0	106	1.0	48.7	5.3	1.0	11.1	4.7
N14229	N11275/N11256	25	26.2	20.6	50.0	105	1.0	49.3	5.3	1.3	14.8	5.0
G14507	G09329/G10412	49	26.0	34.9	48.0	105	1.3	48.0	5.3	2.3	25.9	4.0
G12901	G07321/Fuji, **SAMURAI**	23	26.0	29.6	49.0	108	1.0	50.3	5.3	3.0	33.3	4.7
B14309	B11338/B10222	40	25.9	22.3	49.0	106	1.0	48.7	5.7	1.0	11.1	5.0
N14202	N11249/N11256	22	25.4	24.9	49.0	108	1.7	52.7	5.3	1.3	14.8	3.7
N14218	N11256/N11298	21	25.4	21.0	50.0	108	1.0	48.7	5.3	1.3	14.8	4.7
N12457	B09174/N09056	17	25.3	22.1	48.0	105	1.0	48.3	5.0	1.3	14.8	5.0
G14509	G11404/Eldorado	47	24.7	44.4	48.0	107	2.0	50.3	4.3	3.3	37.0	4.7
I15628	**LIGHTHOUSE**	6	24.4	24.8	49.0	110	1.0	48.0	4.7	1.0	11.1	4.3
N12447	B09174/N09056	15	23.9	24.9	49.0	105	1.0	49.0	5.3	2.3	25.9	4.7
G13444	G07302//G08274/P08410	45	23.9	33.9	48.0	103	1.0	48.3	5.3	1.0	11.1	3.3
N14201	N11249/N11256	28	23.7	22.2	51.0	109	1.0	50.0	5.7	1.0	11.1	4.7
S14708	Rosetta/S11707	60	23.4	44.7	50.0	107	1.0	49.0	4.0	1.3	14.8	2.0
N14230	N11275/N11256	18	23.3	21.8	49.0	107	1.3	50.3	5.3	1.3	14.8	4.7
S08418	S02754/S04503, **ROSETTA**	62	23.2	41.2	50.0	109	1.7	50.0	3.7	1.0	11.1	2.3
R12845	SR9-5/R09508	58	22.9	38.9	47.0	103	1.0	48.7	4.7	1.7	18.5	4.3
P14811	P08403/G11405	55	22.7	38.8	47.0	103	1.3	49.3	4.3	1.7	18.5	4.7
N13131	N09175/N08007	13	22.6	23.5	49.0	105	1.0	47.7	5.3	1.3	14.8	4.7
B04554	B00103*/X00822, **ZORRO**	42	22.4	26.1	49.0	109	1.0	49.0	5.0	1.7	18.5	4.0
N14231	N11275/N11264	19	22.3	24.3	50.0	107	2.0	50.0	4.3	1.3	14.8	4.0
I08933	37-2, USPT-WM-12	4	22.2	42.1	49.0	105	1.0	49.0	4.0	2.0	22.2	2.0
N13140	N05324/MEDALIST	10	22.2	21.7	48.0	106	1.0	49.0	5.7	1.0	11.1	5.0
B13220	B09175/TARS-MST1	34	22.1	25.1	49.0	103	1.0	47.0	5.7	1.3	14.8	5.0
G14505	G11429/P08175	50	22.0	29.3	47.0	103	1.0	47.7	4.3	1.3	14.8	4.7
N11283	MEDALIST/N08003, **ALPENA**	30	21.8	22.1	48.0	104	1.0	49.3	6.0	2.0	22.2	4.3
P14815	P08522/LONG'S PEAK	2	21.8	38.5	49.0	101	1.0	48.0	5.0	1.3	14.8	3.3

EXPERIMENT 5210 NATIONAL WHITE MOLD YIELD TRIAL									PLANTED: 6/10/15			
NAME	PEDIGREE	ENTRY	YIELD CWT /ACRE	100 SEED WT. (g)	DAYS TO FLOWER	DAYS TO MATURITY	LODGING (1-5)	HEIGHT (cm)	DES. SCORE	WM (1-5)	WM %	STAND
S14706	Rosetta/S11707	59	21.6	42.6	48.0	108	1.3	50.0	3.7	1.3	14.8	2.0
B13223	PR0443-151/B09175	32	21.5	26.9	51.0	110	1.0	49.7	5.0	2.0	22.2	5.0
B14313	B11343/B09196	41	21.4	21.6	48.0	103	1.0	45.7	4.7	1.3	14.8	5.0
B14302	B09197/B11334	36	21.4	22.8	51.0	110	1.0	50.3	5.3	2.7	29.6	4.7
N14238	Alpena/N11249	24	21.2	19.4	48.0	104	1.0	46.7	5.3	1.0	11.1	4.3
N14215	N11256/N11292	20	20.5	22.0	49.0	105	1.3	48.3	5.0	1.7	18.5	4.0
P14812	P09425/P08161	56	20.5	45.7	48.0	103	1.0	47.7	5.0	2.0	22.2	3.7
N14243	N11284/N11277	27	20.0	20.6	51.0	103	1.3	50.3	4.7	2.0	22.2	4.3
I15621	**MIST**	5	20.0	24.3	48.0	110	1.0	47.7	4.7	1.0	11.1	4.0
R98026	R94037/R94161, **MERLOT**	61	19.4	40.5	49.0	106	2.0	48.3	4.0	2.0	22.2	4.0
B14310	B11338/B10241	38	19.3	23.2	50.0	104	1.0	43.7	4.7	1.0	11.1	5.0
B12724	B09184/B09135	11	18.7	24.9	50.0	105	1.0	47.0	5.0	1.3	14.8	4.7
I81010	JAPON3/MAGDALENE, **BUNSI**	7	18.6	22.9	47.0	108	1.7	46.7	3.7	1.7	18.5	4.0
R12844	SR9-5/R09508	12	18.4	38.1	47.0	102	1.3	48.0	4.7	1.3	14.8	3.7
I14520	SF103-8	64	17.9	46.2	43.0	106	1.3	45.7	3.3	1.0	11.1	4.0
I11264	COOP 03019, **MERLIN**	29	17.9	21.5	49.0	108	1.0	49.3	4.7	1.3	14.8	4.0
G14503	G11404/G11469	51	17.8	41.1	48.0	104	1.0	46.7	4.7	1.0	11.1	4.3
G08254	G04514/Matterhorn, **POWDERHORN**	53	16.8	41.9	48.0	102	1.0	47.0	4.7	1.0	11.1	3.7
I89011	RB, **BERYL**	8	16.5	36.1	46.0	101	2.7	43.0	3.0	2.7	29.6	4.3
G13479	Eldorado/G09312	44	16.1	35.5	47.0	102	1.3	47.7	4.7	2.0	22.2	4.0
N14206	N11256/N11258	26	15.6	21.2	48.0	105	1.0	45.7	4.7	1.3	14.8	4.3
G14520	P08369/G09303	52	15.0	34.8	48.0	102	1.3	47.7	4.3	1.3	14.8	4.0
N13120	N08003/N05324	14	13.0	25.5	48.0	103	1.0	46.3	5.3	1.3	14.8	4.7
I96417	**G122**	9	8.6	46.5	43.0	109	1.3	44.3	3.0	2.0	22.2	5.0
MEAN (64)			22.9	30.5	48.4	105.9	1.2	48.6	4.8	1.6	17.3	4.2
LSD (.05)			4.6	1.7	1.9	2.4	0.4	2.1	0.8	0.9	9.7	1.0
CV (%)			14.7	4.2	2.4	1.7	25.3	3.3	12.6	41.4	41.4	16.8

EXPERIMENT 5111 DRY BEAN DROUGHT NURSERY YIELD TRIAL								PLANTED: 6/5/15		
NAME	**PEDIGREE**	**ENTRY**	**YIELD CWT /ACRE**	**100 SEED WT. (g)**	**DAYS TO FLOWER**	**DAYS TO MATURITY**	**LODGING (1-5)**	**HEIGHT (cm)**	**DES. SCORE**	**CBB (1-5)**
R12844	SR9-5/R09508	22	30.8	34.5	43.0	93	48.7	1.3	4.3	1.0
B10244	B04644/ZORRO, **ZENITH**	23	30.3	24.7	45.0	101	51.0	1.3	5.0	1.0
I14550	Merlotx(98020-3-1-6-2xTacana)	13	29.6	27.3	45.0	98	48.3	2.0	4.3	1.0
I05834	ND020351, **STAMPEDE**	20	27.2	42.0	44.0	94	46.7	1.7	4.0	3.0
I14546	(USPT-ANT)x('Matterhornx98078-5-1-5-1)	9	26.1	38.8	42.0	93	47.7	1.3	4.0	2.0
I14543	(Tacana x VAX6)	6	25.8	24.9	43.0	97	47.7	1.0	4.0	2.0
B04554	B00103*/X00822, **ZORRO**	24	25.1	20.2	45.0	101	51.3	1.3	5.0	2.0
I14542	(MoralesxXAN 176)x('EAP 9503-32A)	5	24.9	27.8	43.0	91	47.0	2.0	3.7	2.0
I14541	(Black Rhino)x(SEN 10 (SB-DT1)	4	24.5	24.8	44.0	97	48.7	1.7	4.0	1.0
G08254	G04514/Matterhorn, **POWDERHORN**	21	24.3	31.4	41.0	92	48.3	1.3	5.0	3.0
I14553	Merlotx(05F-5055-1x98020-3-1-6-2)	16	24.0	31.0	43.0	93	47.0	1.3	4.0	1.0
I14549	Merlotx(98020-3-1-6-2xTacana)	12	24.0	28.1	44.0	97	50.0	1.7	4.0	3.0
G93414	**MATTERHORN**	17	22.0	32.9	43.0	91	47.0	2.0	4.3	4.0
I14548	Merlotx(MerlotxSER 16)	11	21.8	40.1	43.0	93	45.3	2.0	3.0	2.0
I14552	10486 (TARS-MST1)	15	19.9	21.8	44.0	98	47.0	1.0	4.0	1.0
I14539	(MoralesxXAN 176)x('BAT 477xB98311)	2	18.5	24.4	44.0	98	48.3	2.0	3.3	1.0
R98026	R94037/R94161, **MERLOT**	19	18.4	37.3	38.0	91	42.7	1.7	2.3	2.0
I14540	(BAT 477xL88-63)x('BelMiDak RMR10xB01741)	3	16.6	17.5	46.0	94	47.3	1.3	3.7	4.0
I14544	(BelMiDak RMR10xB01741)x('BAT 477xL88-63)	7	16.5	21.9	45.0	100	48.3	2.0	3.3	2.0
BC138	**Marquis**	18	15.8	28.2	40.0	94	43.0	3.0	3.0	1.0
I14551	10457	14	15.1	28.7	43.0	91	44.0	1.7	3.0	2.0
I14538	(Tacana x VAX6)	1	14.6	18.9	45.0	103	45.7	2.7	3.0	2.0
I14545	(Matterhorn)x(SER 21)	8	14.4	31.0	45.0	94	45.0	2.3	3.0	2.0
I14547	(ABCP8)x(TARS-PT03-1xVAX 6)	10	13.6	20.9	43.0	94	46.0	2.0	3.0	1.0
MEAN (24)			21.8	28.3	43.2	95.4	47.2	1.7	3.8	1.9
LSD (.05)			3.8	1.6	1.1	3.8	1.6	0.7	0.5	(1 Rep)
CV (%)			12.6	4.0	1.5	2.9	2.5	28.3	8.9	

2015 White Mold Fungicide Trial

Greg Varner, Michigan Dry Bean Production Research Advisory Board
Doug Bismack Farm-Minden City, Cooperative Elevator Co.-Ruth, MI

Minden City # 1

TREATMENT	RATE	YIELD	%INCIDENCE	%SEVERITY	%PICK
UNTREATED		2379	75	59	3.9
ENDURA	8 OZ	2799	56	41	2.2
PROLINE	5.7 OZ	3105	52	37	2.1
PROPULSE	8.6	3125	34	21	1.9
OMEGA	8 OZ	3195	62	45	2
APROACH	12 OZ	2990	47	34	2.2
		LSD=494	LSD=16.9	LSD=14.6	LSD=0.5
		C.V.=11.2%	C.V.=26.2%	C.V.=32.8%	C.V.=16.8%

Minden City # 2

TREATMENT	RATE	YIELD	%INCIDENCE	%SEVERITY	%PICK
Untreated		2497	81	65	4.0
ENDURA	8 OZ	3128	53	41	1.9
PROPULSE	8.55 OZ	3180	37	27	2.2
OMEGA	8 OZ	3242	59	44	2.0
APROACH	12 OZ	3127	52	41	2.5
APROACH+ENDURA	8+8 OZ	3337	48	36	1.9
2ND-OMEGA	8 OZ				
		LSD=402	LSD=15.7	LSD=13.7	LSD=0.8
		C.V.=9.6%	C.V.=18.6%	C.V.=21.1%	C.V.=18.4%

Ruby Small Red Beans planted in 20" rows.
Planted: June 5, Harvested: September 17, First Spray: July 24, Second Spray: August 4
Rating Date for % infection and % severity on September 17
Two applications 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.
Harvest area was middle 2 rows by 15 feet.

2015 Eastern Huron County White Mold FungicideTrial

Greg Varner, Michigan Dry Bean Production Research Advisory Board

Buckley Creek Farms LLC.-Cooperative Elevator Co.-Ruth, MI. Trial in Rapson Area

TREATMENT	RATE	YIELD	%INCIDENCE	%SEVERITY	%PICK
Untreated		2093	79	60	4.0
PROPULSE	8 OZ	2565	57	45	3.1
PROPULSE	10.3 OZ	2766	59	45	2.6
ENDURA	8 OZ	2666	59	45	3.0
OMEGA	8 OZ	2932	62	49	2.5
APROACH	12 OZ	2141	65	53	3.8
APROACH+ENDURA	8+8 OZ	2821	57	40	2.3
2ND-OMEGA	8 OZ				
		LSD=449	LSD=15.0	LSD=12.4	LSD=0.8
		C.V.=11.8%	C.V.=16.2%	C.V.=17.4%	C.V.=18.7%

Merlot Small Red Beans planted in 20" rows.
Sprayed on July 24 and August 4 and Harvested September 17
Rating Date for % infection and % severity on September 17
Two applications 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.
Harvest area was middle 2 rows by 15 feet.

2015 Anthracnose Fungicide Trial

Greg Varner, Michigan Dry Bean Production Research Advisory Board

Varner Farm-Merrill

TREATMENT	RATE	YIELD	RATING
UNTREATED		295	8.8
PRIAXOR	6 OZ	2508	0.8
HEADLINE	6.8 OZ	2095	2.0
PROPULSE	8 OZ	1632	5.3
VERTISAN	13.7 OZ	298	8.0
		LSD=452	LSD=0.9
		C.V.=23.0%	C.V.=12.2%

Zorro Black Beans planted June 25, Sprayed August 5, 14, 27, Harvested October 15
Bean plants were inoculated with anthracnose spores eight hours
after first spray. Beans were re-inoculated on August 12.
Rating (1-9) can be multiplied by 10 to show percentage.
Applications 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.
Harvest area was middle 2 rows by 15 feet.

Evaluation of Yellow Bean Germplasm for Agronomic Performance and End Use Quality

Karen Cichy, Jason Wiesinger, and Scott Shaw. USDA-ARS, Sugarbeet and Bean Research Unit

Yellow beans are commercially important in Mexico and South America. They are also increasing in popularity in Africa. They remain a minor class in the United States, but have potential to expand in the future. There is a need for yellow bean varieties adapted to Michigan environmental conditions. The objective of this study was to evaluate a diverse group of yellow beans for agronomic performance, seed color and cooking time. A trial with thirteen yellow beans and two white kidney bean genotypes was planted on June 11, 2015 at the Montcalm Research Farm with two replications per entry. The lines in the trial included numerous lines from Africa as well as a few lines from the U.S. and Canada (Table 1). The yellow color was variable among the genotypes and ranged from pale yellow to bright yellow to yellow brown (Figure 1).

Root rot pressure was very high early in the growing season at the Montcalm Research Farm in 2015 and caused reduced emergence and seedling death in many of the genotypes. A root health score was used to assess the genotypic ability to resist/overcome the root rot. The score was on a scale of 1 to 5 where one indicates a line with 90% or greater reduction in plant stand count at ~20 days after planting and a score of 5 had less than 10% reduction in plant stand. ADP 522 was the best for root health and standing up to the root rot pressure, it was also the only Middle American genotype of the group. Seed yield was reduced because of the root rot. Average seed yield was 1267 kg ha-1 and the highest was 2199 kg ha^{-1} in an Angolan line, ADP 523 and the lowest was 490 kg ha^{-1} in a Canadian line, ADP 781 (Table 2).

Cooking time was measured post-harvest as follows: 25 seed were soaked in distilled water at room temperature for 12 hours, then they were cooked with a pin drop Mattson cooker in boiling distilled water. The cooking time was recorded as the time it takes for 80% of pins to pierce the beans. The two white kidney genotypes cooked the fastest at 17 min. The pale yellow genotypes, ADP 512 and ADP 521 were the next fastest at 18 min each. The longest cooking genotype, ADP 522, cooked in 73 min, this line also had the darkest seed coat color which was more brown than yellow (Figure 2). The fast cooking trait associated with many of the yellow beans may serve as a means to increase interest in this market class among U.S. consumers.

Table 1. Passport data on the 15 genotypes evaluated at the Montcalm Research Farm in 2015.

ID	Genotype	Source	Type	Gene Pool	Growth Habit
ADP0111	Uyole98	Tanzania breeding	variety	Andean	indeterminate
ADP0452	INIAP425	Ecuador breeding	variety	Andean	determinate
ADP0468	PI527538	USGRIN	landrace	Andean	determinate
ADP0469	PI527521	USGRIN	landrace	Andean	determinate
ADP0512	Ervilha	Angola collection	landrace	Andean	indeterminate
ADP0513	Canario	Angola collection	landrace	Andean	indeterminate
ADP0518	Mantegablanca	Angola collection	landrace	Andean	determinate
ADP0520	Chumbo,Cela	Angola collection	landrace	Andean	indeterminate
ADP0521	Cebo,Cela	Angola collection	landrace	Andean	determinate
ADP0522	Amarelo,Cela	Angola collection	landrace	Middle American	indeterminate
ADP0523	Canario,Cela	Angola collection	landrace	Andean	indeterminate
ADP0646	Myasi	ADM	variety	Andean	determinate
ADP0761	Uyole-04	Tanzania breeding	variety	.	indeterminate
ADP0779	CDC-Sol	U. Saskatoon Canada	variety	.	determinate
ADP0781	L11YL012	Alberta-Canada	variety	.	determinate

Table 2. Agronomic data on the 15 genotypes evaluated at the Montcalm Research Farm in 2015.

ID	Genotype	Days to flower	Days to maturity	Root health score*	Lodging score (1 to 5)	Seed wt. (g/100 seed)	Seed yield (kg/ha)
ADP0111	Uyole98	46	108	3	2	45.7	1388
ADP0452	INIAP425	48	124	2.5	1.5	54.7	544
ADP0468	PI527538	46	116	3	1	50.0	1300
ADP0469	PI527521	48	117.5	3	1	42.3	1206
ADP0512	Ervilha	48	116	3	1	52.7	1666
ADP0513	Canario	47	111	3.5	4	40.1	1720
ADP0518	Mantegablanca	49	124	3	5	42.8	993
ADP0520	Chumbo,Cela	50	124	3.5	5	38.7	793
ADP0521	Cebo,Cela	46.5	124	3.5	3.5	39.6	608
ADP0522	Amarelo,Cela	48.5	124	4.5	5	29.3	1798
ADP0523	Canario,Cela	48.5	124	3.5	5	47.5	2199
ADP0646	Myasi	45	109	3	1	44.3	1955
ADP0761	Uyole-04	47.5	116	2.5	2.5	45.2	1013
ADP0779	CDC-Sol	41.5	109	2.5	1	50.7	1339
ADP0781	L11YL012	46.5	108	1.5	1.5	44.5	490
	Mean	47.1	117.0	3.0	2.7	44.5	1267.4
	CV%	2.5	5	26	19	4	42

*Root Health score 1=no diseases; 5= very susceptible

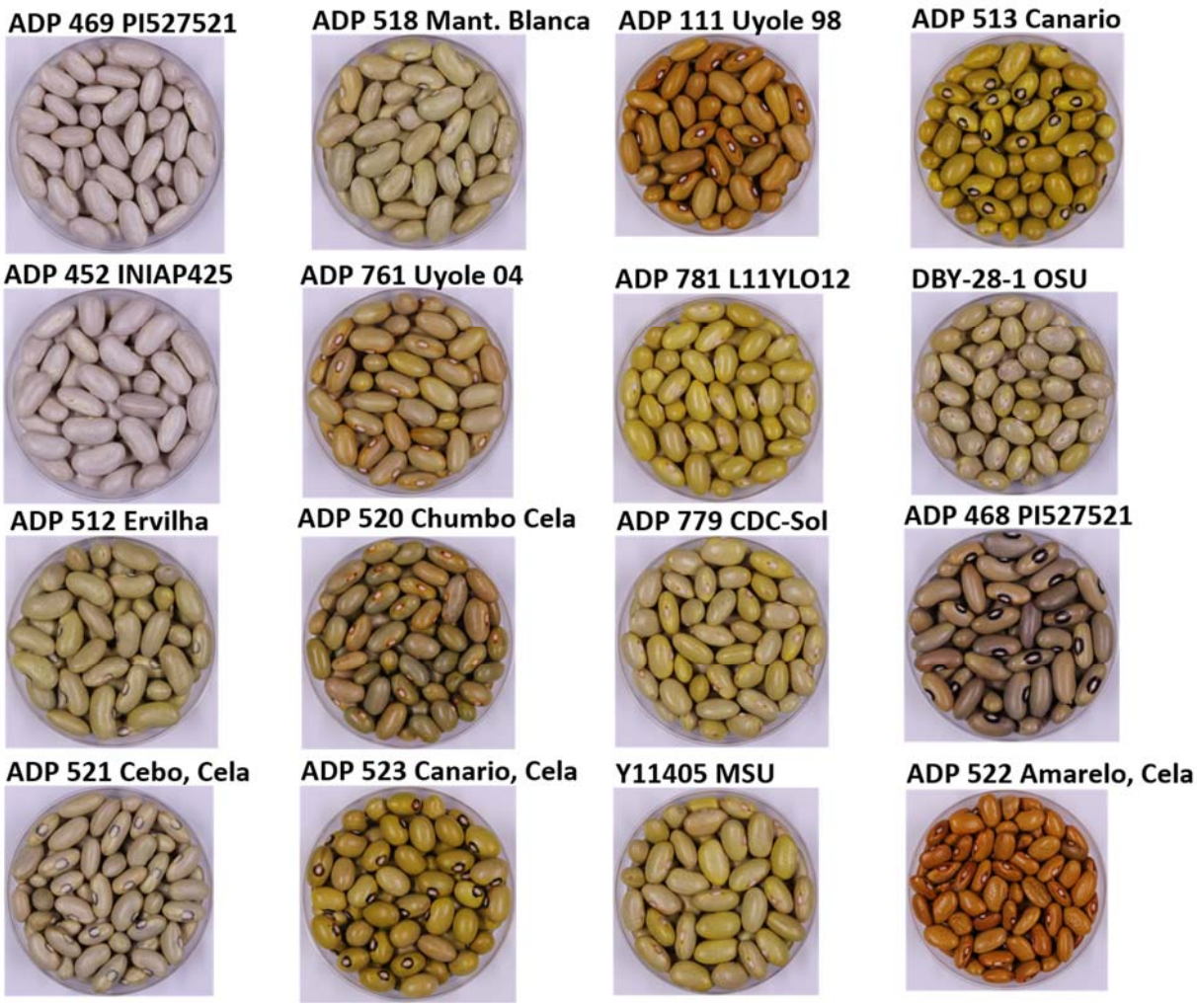

Figure 1. Seed images of the yellow and white bean germplasm evaluated at the Montcalm Research Farm in 2015.

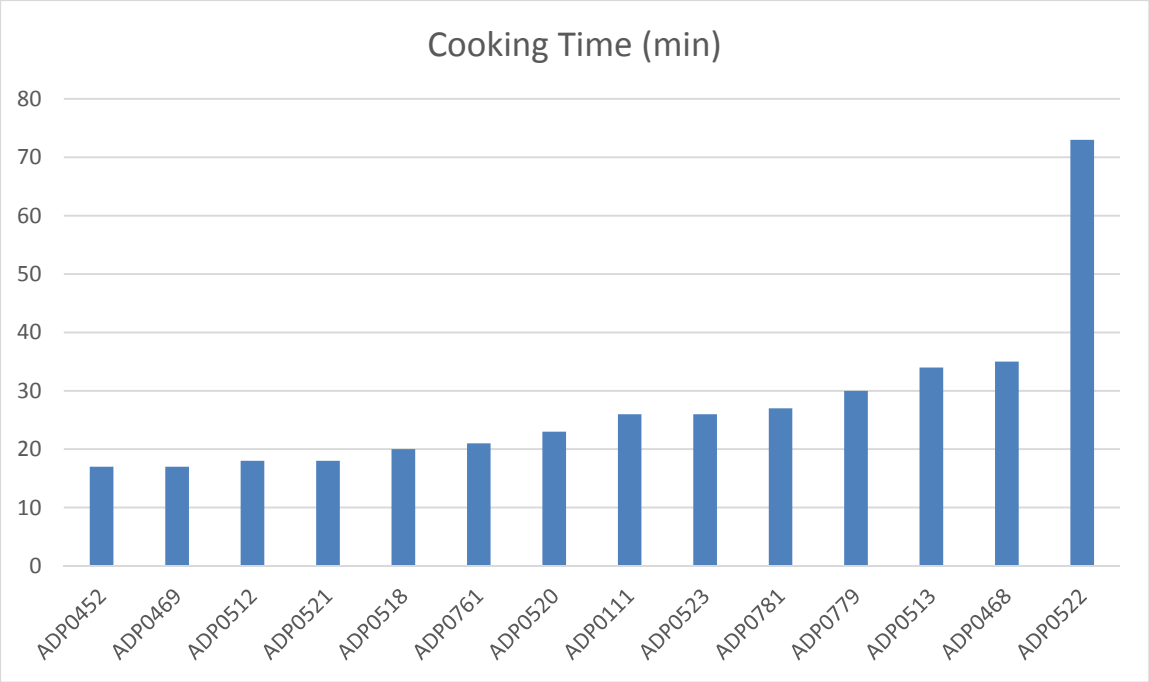

Figure 2. Cooking time of yellow and white beans grown at the Montcalm Research Farm in 2015.

Harvest aid effects on three classes of dry beans

Christy Sprague and Gary Powell, Michigan State University

Location:	Richville (SVREC)	**Tillage:**	Conventional
Planting Date:	June 4, 2015	**Row width:**	30-inch
Replicated:	4 times	**Soil Type:**	Clay loam, 2.6% OM, pH 8.1
Varieties:	'Zorro' black beans	**Populations:**	106,000 seeds/A
	'Merlin' navy beans		106,000 seeds/A
	'El Dorado' pinto beans		100,000 seeds/A

Table 1. Effect of preharvest treatments on bean desiccation (%) 3 & 7 days after treatment (DAT) and yield.

	Zorro			Merlin			El Dorado		
Treatments	**3 DAT**	**7 DAT**	**Yield[a]**	**3 DAT**	**7 DAT**	**Yield**	**3 DAT**	**7 DAT**	**Yield**
Sharpen (1 fl oz) + MSO + AMS	90 bc[b]	97 ab	18.7 ab	76 b	93 a	23.8 a	78 b	98 a	17.6 a
Gramoxone (2 pt) + NIS	83 e	90 c	19.2 ab	82 a	86 b	24.9 a	80 b	80 b	19.8 a
Valor (1.5 oz) + MSO	85 de	93 bc	18.0 ab	70 c	91 ab	24.3 a	79 b	95 a	20.8 a
Roundup (22 fl oz) + AMS	66 g	84 d	20.6 a	62 d	76 c	24.8 a	60 d	74 c	20.7 a
Aim (2 fl oz) + MSO	72 f	79 e	18.9 ab	60 d	76 c	25.4 a	65 c	84 b	21.0 a
Sharpen (2 fl oz) + MSO + AMS	93 b	97 ab	17.2 b	71 bc	94 a	22.8 a	80 b	97 a	18.1 a
Sharpen (1 fl oz) + Roundup + MSO + AMS	87 cd	98 a	18.2 ab	69 c	94 a	24.3 a	82 b	98 a	20.2 a
Sharpen (1 fl oz) + Gramox.+ MSO + AMS	97 a	99 a	18.5 ab	86 a	91 ab	23.0 a	88 a	98 a	18.1 a
Untreated	52 h	65 f	19.6 ab	52 e	58 d	24.0 a	52 e	58 d	20.5 a

[a] Yield is in cwt/A obtained by direct harvest and adjusted to 18% moisture

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

Summary: This study was conducted to evaluate the effects of different preharvest treatments on desiccation and yield of three different classes of dry beans that have different speeds of dry down, 'Zorro' black bean (uniform dry down), 'Merlin' navy bean (green stem), and 'El Dorado' pinto bean (green stem). All preharvest applications were made when 80% of the pods were yellow for each variety. There were some differences in the speed and effectiveness of the different treatments between varieties. However, there were some general trends that were similar among the three varieties. For example, Sharpen + Gramoxone always provided the quickest speed of activity 3 DAT. By 7 DAT, most treatments provided greater than 90% desiccation, with the exception of Roundup and Aim; and Gramoxone alone in 2 of 3 varieties. By 14 DAT, Aim was the only treatment for all three varieties that did not reach 90% desiccation. Yield was only lower in one instance, when Sharpen was applied at 2 fl oz/A to Zorro (12% reduction). Overall, many of the treatments provided good bean desiccation and when applied at 80% pods yellow did not reduce yield. This research was supported by the Michigan Dry Bean Commission through the Michigan Department of Agriculture Specialty Crops grant.

Harvest aid effects on common lambsquarters and dry bean desiccation

Christy Sprague and Gary Powell, Michigan State University

Location:	Richville (SVREC)	**Tillage:**	Conventional
Planting Date:	June 4, 2015	**Row width:**	30-inch
Replicated:	4 times	**Soil Type:**	Clay loam, 2.6% OM, pH 8.1
Varieties:	'Merlin' navy beans	**Populations:**	106,000 seeds/A

Table 1. Effect of preharvest treatment on common lambsquarters and bean desiccation 7 and 14 days after treatment (DAT) and yield.

	C. lambsquarters		'Merlin' navy bean		
Treatments	**7 DAT**	**14 DAT**	**7 DAT**	**14 DAT**	**Yield[a]**
Sharpen (1 fl oz) + MSO + AMS	50 bc[b]	50 c	91 a	97 a	21.7 abc
Sharpen (2 fl oz) + MSO + AMS	60 b	76 b	91 a	98 a	15.9 e
Gramoxone (2 pt) + NIS	77 ab	90 a	84 a	84 bc	20.3 bcd
Valor (1.5 oz) + MSO	33 cd	70 b	85 a	94 ab	19.4 cde
Roundup (22 fl oz) + AMS	11 de	91 a	75 c	98 a	22.5 abc
Aim (2 fl oz) + MSO	20 d	24 d	76 bc	82 c	21.5 a-d
Sharpen (1 oz) +Roundup+ MSO +AMS	18 d	81 ab	84 a	99 a	17.9 de
Sharpen (1 oz) +Gramox.+ MSO + AMS	89 a	94 a	91 a	97 a	23.2 ab
Valor (1.5 oz) +Roundup+ MSO +AMS	43 c	92 a	91 a	98 a	20.1 bcd
Valor (1.5 oz) +Gramox.+ MSO + AMS	90 a	94 a	88 a	92 ab	19.6 cd
Aim (2 fl oz) +Roundup+ MSO +AMS	21 c	88 a	83 b	99 a	21.5 abc
Aim (2 fl oz) +Gramox.+ MSO + AMS	90 a	91 a	90 a	91 ab	21.2 a-d
Untreated	0 e	0 e	0 d	0 d	23.5 a

[a] Yield is in cwt/A obtained by direct harvest and adjusted to 18% moisture

[b] 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 common lambsquarters and bean desiccation and yield. All preharvest applications were made when 80% of the pods were yellow. Gramoxone or combinations with Gramoxone provided the greatest desiccation of common lambsquarters (77% or greater) 7 DAT. These treatment also provided good desiccation of navy beans 7 DAT. By 14 DAT, Gramoxone, Roundup (glyphosate) or combinations with these herbicides were needed for common lambsquarters desiccation. Navy bean yield was lowest when Sharpen was applied at 2 fl oz/A. Bean desiccation was similar for 1 and 2 fl oz/A of Sharpen, but in two trials this year the higher rate of Sharpen is where we have observed lower yields. While we have several years data comparing preharvest treatments, our recommendation if a grower decides to use Sharpen is to use 1 fl oz/A rate, this also reduces the rotation restriction for following crops, such as sugarbeet. In many cases there were no detriments for applying tank-mixtures of the preharvest herbicides. However, Gramoxone or Roundup were in many cases needed to help with weed desiccation. Please refer to the 2016 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.

Effect of Stinger tank-mixtures on weed control and sugarbeet yield

Christy Sprague and Gary Powell, Michigan State University

Locations: Richville (SVREC)	**Application timings**: 2-, 6-leaf beets & @ canopy
Planting Dates: April 15	**Herbicides:** see treatments
Soil Type: Clay loam	**O.M.:** 3.0
Replicated: 4 times	**Variety:** Crystal 351NT

Table 1. Weed control and sugarbeet yield and recoverable white sugar per acre (RWSA) for combinations of Stinger with Roundup (glyphosate) for potential control of glyphosate-resistant weeds.

Herbicide treatments[a]	Timing	C. lambsquarters[b]	Pigweed	Smartweed	Yield	RWSA
		—%—	—%—	—%—	- ton/A -	— lb/A —
Roundup - applied 2X		96	98	99	21.5	5547
Stinger (2 oz)	2-lf	94	99	99	21.0	5274
Stinger (3 oz)	2-lf	96	99	99	23.7	6296
Stinger (4 oz)	2-lf	96	96	99	26.0	6700
Stinger (6 oz)	2-lf	98	99	99	24.4	6236
Stinger (2 oz) fb. (2 oz)	2-lf fb. 6-lf	99	96	99	24.2	6086
Stinger (3 oz) fb. (3 oz)	2-lf fb. 6-lf	97	99	99	23.2	6384
Stinger (2 oz) fb. (4 oz)	2-lf fb. 6-lf	99	99	99	23.4	6130
Stinger (4 oz)	6-lf	98	99	99	27.6	7080
Stinger (6 oz)	6-lf	97	99	98	22.4	5662
Stinger (8 oz)	6-lf	98	99	99	22.6	5845
Stinger (2 oz) fb. (4 oz) fb. (4 oz)	2-lf fb. 6-lf fb. canopy	99	99	99	21.0	5459
$LSD_{0.05}$[c]		4.5	2.9	1.3	6.6	1614

[a] Roundup PowerMax at 22 fl oz/A was applied with all POST herbicide treatments when sugarbeet were at the 2- and 6-leaf stages. All POST treatments included ammonium sulfate at 17 lb/100 gal. See recommendations in the MSU Weed Control Guide for Field Crops.

[b] Weed control was evaluated in mid-August.

[c] Means within a column greater than least significant difference (LSD) value are different from each other.

Summary: A field trial was conducted to evaluate the effects of Stinger tank-mixtures with glyphosate (Roundup) on weed control and sugarbeet yield. Stinger will be the main component of a program to control glyphosate-resistant horseweed (marestail) and/or glyphosate-resistant horseweed. All treatments contained Roundup PowerMax at 22 fl oz/A at each application timing. Overall, sugarbeet injury was low with all treatments, 10 d after the 6-leaf sugarbeet application. For the weed species evaluated the inclusion of Stinger had minimal effect on weed control, in that weed control was over 90% for all weed species regardless of treatment. None of the treatments reduced yield compared with the Roundup only treatments. Due to low variable horseweed populations at the additional site where this study was conducted we are not able to report horseweed control results. However, in our past studies at least two-applications of Stinger at a minimum rate of 3 oz/A were needed for season-long control of glyphosate-resistant horseweed. The treatment that provided the best control of glyphosate resistant horseweed in the past was three applications of Stinger at 2 oz, fb. 4 oz fb. 4 oz/A at the 2-, 6-leaf sugarbeet stages and at canopy closure. We will continue to examine additional methods for glyphosate-resistant horseweed control.

Management of glyphosate (Group 9)-resistant Palmer amaranth in sugarbeet

Christy Sprague and Gary Powell, Michigan State University

Locations: Gratiot Co.; SVREC (Richville)	**Application timings**: PRE, 2-, 6-leaf beets & @ canopy (see comments)
Planting Dates: May 22 (GR); April 15 (SVREC)	**Herbicides:** see treatments
Soil Type: Sandy loam (GR); Clay loam (SVREC)	**O.M.:** 3.1% (GR); 3.0 (SVREC)
Replicated: 4 times	**Variety:** Crystal 059 (GR); 351NT (SVREC)

Table 1. Palmer amaranth control (Gratiot Co.) and sugarbeet yield and recoverable white sugar per acre (RWSA) (SVREC) of selected herbicide programs examined for glyphosate-resistant Palmer amaranth control.

		Gratiot Co.	SVREC (Richville)	
Herbicide treatments[a]	Timing	Palmer amaranth[b]	Yield	RWSA
		— % —	— ton/A—	— lb/A —
Roundup - applied 3X	2-lf fb. 6-lf fb. canopy	0	27.5	6913
Betamix (2 pt) + Warrant (3 pt)	2-lf	80	24.8	6501
Betamix (2 pt) + Dual II Mag. (1.33 pt)	2-lf	84	25.5	6703
Betamix (2 pt) fb. Betamix (3 pt)	2-lf fb. 6-lf	75	27.4	7160
Nortron (3 pt) fb. Betamix (2 pt) fb. Betamix (3 pt) + Warrant (3 pt)[d]	PRE fb. 2-lf fb. 6-lf	99	—	—
Betamix (2 pt) fb. Betamix (3 pt) + Warrant (3 pt)	2-lf fb. 6-lf	79	23.1	6066
Betamix (2 pt) fb. Betamix (3 pt) + Dual II Mag. (1.33 pt)	2-lf fb. 6-lf	60	26.6	7015
Betamix (2 pt) fb. Betamix (3 pt) + Outlook (18 fl oz)	2-lf fb. 6-lf	95	25.8	6662
Betamix (2 pt) fb. Betamix (3 pt) fb. Betamix (3 pt)	2-lf fb. 6-lf fb. canopy	96	24.4	6535
Betamix (2 pt) fb. Betamix (4 pt) fb. Betamix (6 pt)	2-lf fb. 6-lf fb. canopy	88	27.3	6974
Nortron (4 fl oz) + Destiny (1.5 pt)	2-lf fb. 6-lf fb. canopy	30	29.5	7795
Nortron (4 fl oz) + Warrant (3 pt) + Destiny (1.5 pt)	2-lf fb. 6-lf	73	24.6	6279
Nortron (4 fl oz) + Dual II Magnum (1.33 pt) + Destiny (1.5 pt)	2-lf fb. 6-lf	67	24.1	6255
$LSD_{0.05}$[c]		11	4.55	1098

[a] Roundup PowerMax at 32 fl oz/A fb. 22 fl oz/A and 22 fl oz/A was applied in each of the treatments. All POST treatments included ammonium sulfate at 17 lb/100 gal. See recommendations in the MSU Weed Control Guide for Field Crops.
[b] Palmer amaranth control was evaluated in mid-August.
[c] Means within a column greater than least significant difference (LSD) value are different from each other.
[d] This treatment was not included in the trial at SVREC.

Summary: Two field trials were conducted to evaluate possible herbicide treatments to control glyphosate-resistant Palmer amaranth in sugarbeet. The first trial was conducted to evaluate Palmer amaranth control and the second trial was conducted to examine the effects of these treatments on sugarbeet injury and yield. Not all treatments are presented. Results indicate that there are some treatments that show some promise for glyphosate-resistant Palmer amaranth control (Table 1), without reducing yield compared with three applications of glyphosate alone. We will continue to examine additional methods for glyphosate-resistant Palmer amaranth control.

Comparison of chloroacetamide herbicides in sugarbeet

Christy Sprague and Gary Powell, Michigan State University

Locations: Richville (SVREC)	**Application timings**: 2-,4- and 6-leaf beets
Planting Dates: April 15	**Herbicides:** see treatments
Soil Type: Clay loam (SVREC)	**O.M.:** 3.0 (SVREC)
Replicated: 4 times	**Variety:** Crystal 351NT

Table 1. Weed control, sugarbeet yield and recoverable white sugar per acre (RWSA) of selected herbicide programs comparing different chloroacetamide programs when tank-mixed with Roundup (POST).

Herbicide treatments[a]	Timing	C. lambsquarters[b]	Pigweed	C. ragweed	Yield	RWSA
		%			ton/A	lb/A
Roundup - applied 2X	2-lf fb. 6-lf	97	99	99	20.0	5347
Nortron (4 fl oz) - applied 2X	2-lf fb. 6-lf	97	99	98	24.1	6411
Nortron + Warrant (3 pt)	2-lf	82	94	95	21.5	5659
Nortron + Warrant (3 pt)	4-lf	79	96	92	20.6	5381
Nortron + Dual II Mag. (1.33 pt)	2-lf	87	96	89	18.9	4974
Nortron + Dual II Mag. (1.33 pt)	4-lf	96	99	91	18.6	4876
Nortron + Outlook (16 fl oz)	2-lf	93	99	92	24.7	6601
Nortron + Outlook (16 fl oz)	4-lf	96	98	99	22.6	5765
Nortron + Warrant (3 pt) fb. Nortron + Warrant (3 pt)	2-lf fb. 6-lf	97	96	98	20.5	5459
Nortron + Dual II Mag. (1.33 pt) fb. Nortron + Dual II Mag. (1.33 pt)	2-lf fb. 6-lf	99	99	97	23.1	5990
Nortron + Outlook (16 fl oz) fb. Nortron + Outlook (16 fl oz)	2-lf fb. 6-lf	99	99	99	22.5	5916
Untreated		0	0	0	12.3	3295
$LSD_{0.05}$[c]		8	4	8	7.5	2022

[a] Roundup PowerMax at 32 fl oz/A was applied in each of the treatments. All POST treatments included ammonium sulfate at 17 lb/100 gal. See recommendations in the MSU Weed Control Guide for Field Crops.

[b] Weed control was evaluated in mid-August.

[c] Means within a column greater than least significant difference (LSD) value are different from each other.

Summary: A field trial was conducted to compare the addition of three chloroacetamide herbicides, Warrant, Dual II Magnum, or Outlook, as layby herbicides applied in combination with Nortron and Roundup POST for weed control and the effects on sugarbeet yield and recoverable white sugar. There was very little sugarbeet injury from any of the treatments. Overall, weed control was excellent when at least two weed control applications were made. When two POST herbicides were made with the weed species examined there was no detriment on weed control by adding any of the herbicides and there were no reductions in sugarbeet yield or RWSA. Common lambsquarters and in some cases common ragweed control was lower when only one herbicide application was made. While there was not many differences observed in this trial for weed control or sugarbeet yield, the inclusion of Warrant, Dual II Magnum, or Outlook may be valuable tools when tank-mixed with glyphosate at the 2- or 6-leaf stages of sugarbeet. These herbicides would add a different herbicide site of action group in sugarbeet to help control later emerging pigweed species (i.e., Palmer amaranth and/or waterhemp) that are showing up as glyphosate-resistant in many areas of Michigan.

MSU Wheat Breeding and Genetics 2015 Report

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Introduction

Michigan had the highest non-irrigated wheat yield in the United States at 81 bu/ac in 2015(nass.usda.gov). 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 (MSU-WBG) conducts early generation selection and preliminary yield testing at the Saginaw Valley Research and Extension Center near Richville, MI.

Two large yield testing projects were conducted at SVREC in 2015. As part of the variety development program, preliminary yield trials (PYT) were conducted in order to target new high yielding varieties to the thumb region. A yield trial was conducted with an introgression and association mapping population that samples diversity from a wild ancestral wheat species to identify new genes conferring high yield potential.

MSU Wheat Breeding and Genetics Preliminary Yield Trials

Plant Materials and Trial Design

A total of 672 new soft red and soft white winter wheat entries and three check varieties were included in the wheat breeding yield trials. An augmented design was used where new PYT entries planted in single replicates. Check varieties were replicated across the field. A total of 18 blocks were used to account for field variation. The main check, Ambassador, was planted in six plots per block. Other checks, Pioneer 25R39 and AC Mountain were planted twice in each block. The augmented design and its variants allow for balanced resource allocation for testing a large number of new PYT entries.

Data Collected

Data were collected on flowering and Fusarium head blight on a 0-9 scale (Table 1.). At physiological maturity, spikes were harvested from white wheat entries for pre-harvest sprouting selection and experiments. Grain yield and moisture were collected at harvest. Additional data on resistance to Septoria and Cephalosporium Stripe pathogens are presented in Table 1.

Statistical Analysis

All statistical analysis was done using R. ANOVA using the three check varieties was used to estimate error across the experiment. Effects of individual blocks were determined and yield values of experimental lines were adjusted accordingly. ANOVA was performed on visual sprouting data and values for individual lines were adjusted based on sampling date.

Table 1. Wheat genotypes in preliminary testing with grain yield significantly higher than check varieties. Data on resistance to Pre-harvest sprouting, FHB Septoria, and Cephalosporium Stripe pathogens are presented.

Line	Pedigree	Yield, bu/Ac SVREC	FHB SVREC 0-9	FHB Nursery %Severity	PHS 0-9	Septoria 0-9, Mason	C. Stripe 0-9, Mason
MI14R0029	SE0010286-7 / VA05W-257	98.4	6	49.5	-	4	7
MI14R0354	E0028 / VA03W-409	98.0	7	49.5	-	4	7
MI14R0009	UNKNOWN	97.4	7	64.5	-	2	2
MI14R0008	UNKNOWN	97.2	8	66	-	-	-
MI14R0343	E0028 // Pioneer 25R47 / AgriPro Branson	94.8	6	72.5	-	3	6
MI14R0666	E0039/P 25R18	94.7	3	27	-	7	7
MI14W0298	Aubrey / MO 050699	93.0	3	17.5	6	4	2
MI14W0598	E0027/E5201	92.9	8	66	5	2	5
MI14R0025	SE0010286-7 / VA05W-257	92.4	9	64.5	-	-	-
MI14W0335	D8006W // FHB 12 / MSU Line D8006W	91.9	8	27	8	8	6
MI14R0353	E0028 / VA03W-409	91.9	8	50	-	4	7
MI14W0307	E0028 // Pioneer 25R47 / MSU Line E6003	91.5	2	27	6	5	3
MI14R0667	E0039/P 25R18	91.4	2	27	-	7	5
MI14R0360	E0028 / VA03W-409	91.1	7	49.5	-	8	8
MI14W0084	Crystal /3/ E6003 // MSU Line D8006W / Cayuga	91.0	4	17.5	4	8	1
MI14R0329	D8006W // FHB 12 / Pioneer 25R47	91.0	4	27	-	4	8
MI14R0154	Hopewell // E0028 / MO 050699	90.5	4	56	-	7	5
MI14W0652	TW93213 / MI D6234	90.4	7	27	2	4	9
MI14R0352	E0028 / VA03W-409	90.4	6	43.5	-	7	8
MI14W0315	E0028 // Pioneer 25R47 / MSU Line E6003	90.4	3	21	6	9	6
MI14W0344	E0028 // Pioneer 25R47 / AgriPro Branson	90.3	8	66	6	4	5
MI14W0333	D8006W // FHB 12 / MSU Line D8006W	89.8	8	56	7	4	6
MI14R0270	MCIA Oasis / D8006W	89.5	7	49.5	-	7	8
MI14R0665	E0039/P 25R18	89.5	2	-	-	6	0
sMI14W0463	NY BATAVIA / P25W33	89.4	7	41.5	3	4	6
P25R39	-	83.4	5	-	-	5	5
AC Mountain	-	79.8	8	64.5	9	5	5
Ambassador	P27W37/D1148	77.2	9	70	9	8	8

= Yield significantly higher than P25R39

= Yield significantly higher than AC Mountain

= Yield significantly higher than Ambassador

Results and Discussion

Heavy disease pressure enabled accurate observations of FHB infection in PYT entries. The uniform susceptibility of the Ambassador and AC Mountain indicated uniformity of infection across the field. The entire range of highly resistant to highly susceptible was identified among PYT entries.

Significant variation was identified among field blocks making it necessary to adjust entry values based on block effect. The least significant interval (LSI) to confidently determine an entry yield is higher than the check mean was 12.96 bu/Ac. The significant difference between entries was 9.3 bu/Ac. The significant difference between a new entry and the Ambassador check mean was 7.1 bu/Ac.

Of the 672 entries in preliminary yield trials, 120 yielded higher than the average of the running check variety Ambassador. Of these, 25 had yields that exceeded the LSI interval to out-yield Ambassador, nine out-yielded AC Mountain and four out-yielded P25R39 (Table 1.). Yields of the top 25 entries are not significantly different indicating that the entries all have good yield potential and are superior to the check varieties. A total of 100 entries were moved into advanced yield trials at five locations across Michigan in 2016.