# 2016 RESEARCH REPORT

# SAGINAW VALLEY

# RESEARCH & EXTENSION CENTER

## MICHIGAN STATE UNIVERSITY

**AgBioRESEARCH**

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# SAGINAW VALLEY RESEARCH AND EXTENSION CENTER REPORT

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## INTRODUCTION

The Michigan sugar beet grower cooperative, Michigan Sugar Company, and the Michigan dry bean growers and industry represented by the Michigan Bean Commission and Michigan Bean Shippers Association, donated the proceeds of the 120 acre Saginaw Valley Bean and Beet Research Farm, located in Saginaw County for 38 years, to Michigan State University in 2009. The Michigan State University Office of Land Management then purchased and operates a 320 acre farm near Richville Michigan in Denmark Township. The site is being established as an AgBioResearch research center. The Education Center was completed in 2016 and is hosting numerous events. An additional 150 acres was purchased with the help of funds from the Michigan Wheat Industry to expand wheat research in the region. 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 2016 season was the eighth season of research at the site. This research report is primarily a compilation of research conducted at the site in 2016. 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 2016 collected with the automated rain gauge is given in Table 1. The monthly totals are given at the bottom of the table. Rainfall was above average in March, June and July and below average all other months. Planting in the spring was timely with good rains to help emergence. The rainfall total of 25.87" was below average. Maximum and minimum daily temperatures along with growing degree days (base $50^0$F) are given in Table 2. The 2016 season was hot with 9 days above 90 degrees and 44 days above 85 degrees. The growing degree days for 2016 was 2809 which was above the 5 year average and the second highest in the long term average. Rainfall was timely, the heat hurt the earlier planted dry beans but all other crops yielded well. The average yields for crops grown on the farm was: corn at 200 bushels/acre, soybeans at 80 bushels/acre, wheat at 100 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 |
|---|---|---|---|---|---|---|---|---|
| 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 |
| 2016 | 37.50 | 274.00 | 509.00 | 688.50 | 680.00 | 430.50 | 189.50 | 2809.00 |
| AVERAGE | 63.61 | 247.57 | 489.39 | 626.61 | 559.77 | 327.78 | 97.05 | 2411.78 |

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

MAXIMUM-MINIMUM AIR TEMPERATURES (F)
SAGINAW VALLEY RESEARCH & EXTENSION CENTER - 2016

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

MAXIMUM-MINIMUM AIR TEMPERATURES (F)
SAGINAW VALLEY RESEARCH & EXTENSION CENTER - 2016 cont.

| | JULY | | AUGUST | | SEPTEMBER | | OCTOBER | | NOVEMBER | | DECEMBER | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAY | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN |
| 1 | 72 | 53 | 80 | 58 | 72 | 51 | 63 | 55 | 74 | 45 | 42 | 35 |
| 2 | 79 | 48 | 87 | 57 | 73 | 48 | 69 | 49 | 62 | 51 | 38 | 32 |
| 3 | 83 | 51 | 89 | 62 | 76 | 44 | 67 | 53 | 54 | 46 | 38 | 32 |
| 4 | 83 | 52 | 91 | 62 | 79 | 48 | 73 | 49 | 54 | 36 | 36 | 31 |
| 5 | 86 | 65 | 88 | 64 | 85 | 55 | 79 | 58 | 65 | 41 | 40 | 30 |
| 6 | 85 | 64 | 84 | 58 | 90 | 68 | 79 | 53 | 66 | 33 | 39 | 25 |
| 7 | 89 | 63 | 80 | 56 | 87 | 68 | 81 | 54 | 66 | 37 | 36 | 30 |
| 8 | 87 | 63 | 83 | 52 | 82 | 66 | 55 | 37 | 58 | 44 | 30 | 24 |
| 9 | 78 | 59 | 89 | 54 | 81 | 62 | 58 | 33 | 63 | 37 | 28 | 21 |
| 10 | 83 | 56 | 91 | 61 | 72 | 59 | 62 | 32 | 62 | 38 | 25 | 17 |
| 11 | 85 | 63 | 91 | 65 | 72 | 50 | 71 | 45 | 52 | 26 | 27 | 20 |
| 12 | 91 | 67 | 89 | 71 | 77 | 51 | 74 | 48 | 48 | 24 | 30 | 25 |
| 13 | 87 | 68 | 87 | 70 | 81 | 56 | 56 | 39 | 56 | 36 | 26 | 2 |
| 14 | 86 | 67 | 82 | 64 | 72 | 52 | 62 | 35 | 57 | 35 | 20 | 1 |
| 15 | 74 | 59 | 82 | 61 | 73 | 43 | 69 | 43 | 59 | 35 | 12 | 2 |
| 16 | 76 | 58 | 80 | 66 | 78 | 48 | 70 | 60 | 57 | 36 | 17 | 1 |
| 17 | 85 | 54 | 84 | 63 | 77 | 63 | 76 | 61 | 62 | 35 | 23 | 12 |
| 18 | 85 | 64 | 84 | 59 | 76 | 57 | 77 | 50 | 70 | 55 | 21 | -1 |
| 19 | 78 | 59 | 85 | 66 | 83 | 52 | 69 | 45 | 58 | 29 | 15 | 2 |
| 20 | 88 | 52 | 83 | 64 | 82 | 58 | 57 | 49 | 32 | 23 | 28 | 7 |
| 21 | 87 | 68 | 73 | 57 | 78 | 52 | 52 | 44 | 35 | 21 | 31 | 22 |
| 22 | 92 | 71 | 76 | 51 | 82 | 58 | 53 | 61 | 35 | 20 | 37 | 28 |
| 23 | 91 | 63 | 80 | 55 | 69 | 52 | 63 | 37 | 36 | 22 | 35 | 26 |
| 24 | 84 | 69 | 82 | 58 | 69 | 46 | 53 | 34 | 40 | 35 | 35 | 32 |
| 25 | 88 | 66 | 82 | 64 | 73 | 43 | 52 | 29 | 41 | 35 | 35 | 31 |
| 26 | 89 | 59 | 81 | 58 | 66 | 49 | 40 | 28 | 41 | 35 | 55 | 32 |
| 27 | 90 | 62 | 73 | 59 | 63 | 47 | 44 | 35 | 41 | 31 | 34 | 24 |
| 28 | 84 | 59 | 81 | 65 | 69 | 43 | 55 | 30 | 48 | 34 | 36 | 23 |
| 29 | 77 | 63 | 83 | 59 | 63 | 57 | 70 | 49 | 56 | 46 | 36 | 28 |
| 30 | 72 | 62 | 83 | 63 | 60 | 55 | 52 | 33 | 53 | 38 | 28 | 24 |
| 31 | 76 | 60 | 75 | 60 | | | 52 | 30 | | | 39 | 27 |

# 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 |
| 2016 | 0.94 | 0.73 | 4.09 | 1.30 | 1.59 | 1.51 | 3.47 | 5.15 | 2.03 | 2.11 | 2.14 | 0.81 | 25.87 |
| AVG. | 1.18 | 1.09 | 1.45 | 2.79 | 2.84 | 2.66 | 2.34 | 3.01 | 2.98 | 2.49 | 2.31 | 1.29 | 26.41 |

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

## PRECIPITATION - SAGINAW VALLEY RESEARCH & EXTENSION CENTER- 2016

| Day: | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | 0.02 | 0.18 | | 0.27 | | | 0.01 | | |
| 2 | | 0.35 | | 0.09 | 0.01 | | | | | | 0.22 | 0.05 |
| 3 | | 0.04 | 0.19 | 0.01 | | | | | | 0.01 | 0.53 | |
| 4 | | | | | 0.24 | 0.15 | | | | | | |
| 5 | | | 0.05 | | | 0.33 | | | | 0.22 | | 0.21 |
| 6 | | | | 0.14 | | 0.08 | | | | 0.01 | | |
| 7 | | | 0.01 | 0.02 | 0.02 | | 1.15 | | 0.56 | | | |
| 8 | 0.18 | | | | | | 0.16 | | | | 0.02 | |
| 9 | 0.25 | | | | | | | | | | | |
| 10 | 0.12 | | | 0.11 | | | | | 0.22 | | | |
| 11 | | 0.08 | | 0.01 | 0.03 | | | | | | | |
| 12 | | | | | 0.42 | | 0.14 | 0.10 | | 0.56 | | |
| 13 | | | 0.16 | | 0.07 | | | 0.68 | | | | |
| 14 | 0.02 | | 0.03 | | 0.62 | | | 0.15 | | | | |
| 15 | 0.12 | | | | | 0.08 | 0.01 | | | | | |
| 16 | 0.01 | 0.04 | 0.63 | | | 0.87 | | 2.76 | | 0.23 | | |
| 17 | | 0.02 | 0.02 | | | | | 0.48 | 0.35 | | | |
| 18 | | | | | | | | 0.01 | | | 0.29 | 0.05 |
| 19 | | 0.02 | | | | | | | | | 0.03 | |
| 20 | | | | 0.10 | | | | 0.24 | | | | |
| 21 | | | | 0.01 | | | 0.12 | 0.05 | 0.14 | | | |
| 22 | | | 0.02 | | | | | | | | | 0.01 |
| 23 | | | 0.06 | 0.01 | | | | | | 0.06 | 0.33 | |
| 24 | | 0.03 | 1.04 | 0.26 | | | 0.19 | | | 0.01 | 0.03 | 0.12 |
| 25 | 0.02 | 0.12 | | 0.21 | | | | 0.36 | | | 0.07 | |
| 26 | 0.04 | | | | | | | | 0.12 | 0.50 | | 0.35 |
| 27 | | | 0.1 | | | | 0.02 | 0.32 | | 0.47 | | |
| 28 | | 0.03 | 0.78 | 0.21 | | | | | 0.07 | | 0.29 | |
| 29 | | | | 0.10 | | | | | 0.07 | | 0.31 | |
| 30 | | | 0.16 | | | | 1.14 | | 0.50 | 0.03 | 0.02 | |
| 31 | 0.18 | | 0.84 | | | | 0.27 | | | | | 0.02 |
| TOTAL | 0.94 | 0.73 | 4.09 | 1.30 | 1.59 | 1.51 | 3.47 | 5.15 | 2.03 | 2.11 | 2.14 | 0.81 |

Rainfall is measured in inches

2016 YEAR END TOTAL - 25.87 INCHES

**Sugar beet activities of the USDA-ARS East Lansing conducted in cooperation with Saginaw Research & Extension Center during 2016**

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

Evaluation and rating plots were planted at the Saginaw Valley Research & Extension Center (SVREC) in Frankenmuth, MI in 2016 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 May 6, 2016, the BSDF CRR evaluation nursery was planted on May 8, 2016, and the other evaluation and breeding nurseries on May 9 and 10. A randomized complete-block design with one to five replications was used, depending on the specific test. All plots were 15 ft long 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 by a pre-plant application of ethofumesate 9 May, followed by 4 times with mixtures of phenmedipham, desmedipham, triflusulfuron methyl, and clopyralid (18 and 24 May and 10 and 21 Jun) and once with S-metolachlor (29 Jun). Hand weeding was done as needed to control larger weeds. The BSDF trials were thinned by hand with the generous help of Michigan Sugar Cooperative. Bolting beets were removed throughout the season. In the CLS nurseries, Quadris 2.08SC (azoxystrobin) was applied at 0.0091 kg/100 m row in a 14 cm band in-furrow at planting to help control Rhizoctonia damping-off.

**Cercospora Nurseries:**

The BSDF cooperative CLS evaluation nursery had entries from three companies, with a total of 204 entries evaluated (including 40 non-Roundup Ready entries). This nursery was 2-row, 4 replications conducted in a double-blind fashion. The nursery was inoculated on July 5 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 2015 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. For all CLS nurseries, high definition videos of disease development were taken throughout the season, roughly twice per week depending on weather.

In addition to commercial entries, 30 Plant Introductions (see below) and 102 USDA-ARS breeding lines and checks from three USDA cooperators (Kimberly, ID, Ft. Collins, CO, East Lansing, MI) were evaluated in randomized replicated trials on two dates. Kimberly entry ratings (14 entries) ranged from 3.75 to 6.00, excluding the checks EL50/2 (score 3.25) and F1042 (score 7.00) (overall mean 4.59, LSD 0.05 = 0.75) on the last rating on September 2. Fort Collins' (60 entries) ratings ranged from 3.75 to 6.50, with an overall mean including the same

checks of 4.89 (LSD 0.05 = 0.78). East Lansing (28 entries in a replicated randomized trial) scores ranged from 3.75 to 5.50, with a mean of 4.38 (LSD 0.05 = 0.76), on August 30, including the resistant EL50/2 (score 3.00) and susceptible F1042 (score = 5.75). In addition, 134 East Lansing breeding lines were examined in a non-randomized replicated trial to evaluate breeding potential (see below for results of East Lansing germplasm, Table 2).

**Rhizoctonia nurseries:**

The BSDF cooperative CRR Eastern Evaluation Nursery had entries from four companies, with a total of 298 entries (40 entries were conventional varieties) plus two control varieties evaluated. This nursery was 1-row with 5 replications conducted in a double-blind fashion. In addition, susceptible or moderately resistant varieties were planted to collect sacrificial samples through the season and assess root rot development. The nursery was inoculated on June 28 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 8, 9, 10, and 11with 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 4.8 to 6.8 (mean = 5.9), with the percent of roots classified as "harvestable" (less than 25% of the root rotted) ranging from 0% to 39% for the different varieties.

A seedling Rhizoctonia nursery was also conducted at the SVREC in 2016. This trial included the commercial conventional entries, plus 173 East Lansing breeding lines and 10 Fort Collins entries. The singular difference between the conventional CRR and seedling trials was that the seedling nursery was inoculated on Jun 8 whereas the conventional CRR was inoculated 20 days later. Of the East Lansing entries, 28 releases and potential releases were planted in a 5-fold replicated single row design (the same entries were tested in the Cercospora, Aphanomyces, and Agronomic nurseries; Table 1). Other entries were planted in various non-randomized configurations for preliminary assessments and breeding selections for potential future germplasm releases.

**Results from screening East Lansing materials:**

The 28 entries for which sufficient seed was available and which had not been tested in an agronomic nursery (for sugar yield estimates) are a mix of previously released (e.g. distributed to BSDF member breeding companies) but unpublished germplasm developed at East Lansing (prefaced with either an EL or SR designation) or germplasm available for release (Table 1). These materials were tested in an Agronomic nursery, the Cercospora nursery, the Seedling Rhizoctonia nursery, and the Betaseed Inc. Shakopee MN Aphanomyces nursery (whose help is gratefully acknowledged).

The East Lansing replicated Cercospora trial was taken to harvest (Table 1). Given the recent problems surrounding Cercospora leaf spot and its control, alternative approaches to meeting this challenge are, of course, desired. Genetic resistance is one of those alternatives, and screening of germplasm has been conducted for almost as long as sugar beets have been grown in areas subject to the disease. However, no immunity has been found, and it has proven difficult

**Table 1**: Agronomic performance (upper, sorted by White Sugar Yield) and disease scores (lower, by Entry) of East Lansing replicated trials of potential and germplasm releases. Bold is not significantly different than 'best'. WSY is white sugar yield. na = not available.

| Entry | Accession | Name | Plot wt Cerc (lbs) | Plot wt Agron | Sugar % Cerc | Sugar % Agron | Purity % Cerc | Purity % Agron | WSY Cerc (lbs/plot) | WSY Ag | % Reduction |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | EL-A027152 | SR100 | 27.0 | **41.9** | 13.0 | **17.0** | 93.9 | 95.0 | **3.66** | **7.71** | 52.5 |
| 20 | EL-A12-00018 | 2011 Rhizoctonia Selections | **37.5** | **40.2** | 12.9 | **17.5** | 93.0 | 94.8 | **4.97** | **7.58** | 34.5 |
| 11 | EL-A027154 | Rhizoc / rhizopus selection | **29.0** | **44.0** | 13.2 | 15.7 | 93.3 | 94.7 | **4.02** | **7.31** | 45.0 |
| 3 | EL-A022784 | Sclerotium rolfsii tolerant x 08-5E (nematode) | 21.5 | **44.2** | 11.9 | 14.5 | 93.4 | 93.3 | 2.62 | **6.74** | 61.0 |
| 15 | EL-A029768 | EL59 | 25.1 | **36.3** | 12.2 | **17.0** | 92.9 | 94.6 | 3.13 | **6.65** | 52.9 |
| 7 | EL-A027017 | EL65 | **31.8** | **37.8** | 12.5 | 15.8 | 93.6 | 94.5 | **4.19** | **6.44** | 35.0 |
| 8 | EL-A027146 | PI 355963 germ test sele | **38.3** | **41.0** | 10.7 | 14.2 | 92.9 | 93.8 | **4.17** | **6.11** | 31.8 |
| 25 | EL-A1402163 | NSCR (Grp 4) | 17.4 | **32.6** | **13.6** | **17.1** | 92.9 | 95.3 | 2.45 | **6.08** | 59.7 |
| 22 | EL-A1402159 | NIC Storage&SR Rhiz (Grp 7&8) | **32.1** | **35.5** | 12.3 | 15.4 | 92.8 | 95.0 | **4.10** | **5.89** | 30.3 |
| 9 | EL-A027149 | SR98x | 23.7 | **30.8** | 12.6 | **16.8** | 93.7 | 94.9 | 3.22 | 5.63 | 42.8 |
| 788 | EL-A015033 | USH20 | na | 28.9 | na | **17.1** | na | 95.9 | na | 5.45 | na |
| 6 | EL-A024988 | M1-3x | 21.7 | **31.0** | 13.5 | **16.3** | 93.5 | 93.5 | 3.07 | 5.42 | 43.4 |
| 2 | EL-A022775 | EL58 | **28.2** | **30.1** | 12.1 | **16.4** | 93.3 | 95.5 | 3.53 | 5.40 | 34.7 |
| 26 | EL-A15-00005 | storage | **33.3** | **31.7** | 13.0 | 15.8 | 93.1 | 95.0 | **4.48** | 5.39 | 16.8 |
| 17 | EL-A029770 | EL62 | 18.2 | **32.7** | 12.8 | 15.4 | 93.3 | 95.0 | 2.44 | 5.31 | 54.0 |
| 14 | EL-A029704 | SR98/2 | 26.6 | 29.2 | 12.3 | **16.4** | 92.6 | 95.6 | 3.35 | 5.22 | 36.0 |
| 23 | EL-A1402161 | NIC Nematode Sucrose group | 27.4 | **30.2** | 12.4 | 15.9 | 93.4 | 95.4 | 3.54 | 5.15 | 31.3 |
| 27 | EL-A15-00006 | SR102 | **29.0** | **31.9** | 12.6 | 14.9 | 93.3 | 95.0 | **3.78** | 5.09 | 25.7 |
| 16 | EL-A029769 | EL61 | 22.6 | 29.5 | 12.4 | 15.9 | 93.1 | 94.5 | 2.83 | 5.02 | 43.6 |
| 816 | EL-A012174 | SR97 | na | 26.0 | na | **17.5** | na | 95.1 | na | 4.95 | na |
| 24 | EL-A1402162 | Cercospora (Grp 1) | **28.4** | **30.3** | 12.6 | 15.1 | 93.2 | 94.1 | **3.71** | 4.86 | 23.7 |
| 12 | EL-A027158 | rhizoc - SR | 20.2 | 26.3 | 11.6 | **16.6** | 93.2 | 95.7 | 2.33 | 4.76 | 51.1 |
| 19 | EL-A12-00004 | rhizoc, nema | 22.9 | 23.8 | 12.4 | **16.7** | 92.9 | 95.6 | 2.91 | 4.34 | 32.9 |
| 13 | EL-A029686 | SF"A" | 17.0 | 23.7 | 12.9 | 15.8 | 93.8 | 94.6 | 2.25 | 4.05 | 44.5 |
| 28 | EL-A15-01095 | elites (EL50;storage;rhizoc;suc;nema) x wilds | 22.7 | 20.2 | 11.5 | **17.7** | 92.9 | 94.8 | 2.66 | 3.89 | 31.4 |
| 5 | EL-A024983 | SR99 | **28.9** | 22.0 | 12.2 | **16.2** | 94.1 | 93.9 | **3.65** | 3.82 | 4.5 |
| 1 | EL-A015027 | C869 CMS | 14.4 | 15.0 | 11.1 | **16.7** | 93.3 | 96.0 | 1.62 | 2.74 | 40.8 |
| 18 | EL-A12-00003 | SR98 x SF | 13.2 | 15.9 | 12.6 | 15.5 | 92.7 | 94.0 | 1.72 | 2.61 | 34.2 |
| 21 | EL-A13-03848 | EL RHIZOC | 10.9 | 6.8 | 11.9 | **18.5** | 92.7 | 94.4 | 1.31 | 1.36 | 3.6 |
| 4 | EL-A022806 | HS elites & (low water x nema) | 27.1 | na | 13.0 | na | 93.1 | na | **3.64** | na | na |
| 817 | EL-A021482 | EL50/2 | 20.3 | na | **15.4** | na | 94.3 | na | 3.33 | na | na |
| 818 | EL-A1402166 | Fargo Cerc Susc check | 8.0 | na | 12.5 | na | 93.7 | na | 1.04 | na | na |
| | | Mean | 24.48 | 31.03 | 12.51 | 16.14 | 93.28 | 94.83 | 3.17 | 5.37 | 37.0 |
| | | F test | 3.45*** | 2.19ns | 2.04** | 2.13** | 0.89ns | 1.33ns | 3.07*** | 2.25** | |
| | | LSD 0.05 | 10.07 | 15.36 | 1.83 | 1.93 | 1.41 | 1.74 | 1.37 | 2.54 | |

| Entry | Accession | Name | Scheme | Generation | Cercospora 8/30/16 | Cercospora 9/7/16 | Seedling Rhizoctonia Jun 8 Stand | Seedling Rhizoctonia Oct 4 Stand | Seedling Rhizoctonia Oct4 / Jun8 | Aphanomyces (Betaseed) | Aphanomyces Root score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | EL-A015027 | C869 CMS | SF | source | 5.25 | 6.25 | 9.6 | 2.6 | 0.27 | | 4.92 |
| 2 | EL-A022775 | EL58 | self sterile | IC-1 | 5.00 | 5.75 | 14.0 | 4.0 | 0.26 | | 4.50 |
| 3 | EL-A022784 | Sclerotium rolfsii tolerant x 08-5E (nematode) | self sterile | IC-1 | 5.50 | 6.00 | 11.0 | 2.0 | 0.26 | | nd |
| 4 | EL-A022806 | HS elites & (low water x nema) | self sterile | IC-1 | 5.00 | 5.75 | 10.2 | 4.8 | 0.39 | | **3.58** |
| 5 | EL-A024983 | SR99 | self sterile | IC-2 | 4.50 | 5.75 | 9.7 | 2.3 | 0.20 | | 5.42 |
| 6 | EL-A024988 | M1-3x | self sterile | IC-3 | 4.50 | 5.50 | 13.0 | 5.5 | **0.50** | | nd |
| 7 | EL-A027017 | EL65 | self sterile | IC-1 | 5.00 | 5.75 | **22.2** | 3.8 | 0.24 | | 5.25 |
| 8 | EL-A027146 | PI 355963 germ test sele | self sterile | IC-1 | 5.00 | 6.25 | **25.6** | **7.0** | 0.29 | | 4.58 |
| 9 | EL-A027149 | SR98x | self sterile | IC-1 | **3.75** | 5.00 | 12.4 | **7.6** | **0.66** | | **4.00** |
| 10 | EL-A027152 | SR100 | self sterile | IC-3 | 5.00 | 6.00 | 11.0 | 3.8 | 0.40 | | **3.17** |
| 11 | EL-A027154 | Rhizoc / rhizopus selection | self sterile | IC-1 | **3.75** | **4.75** | 7.8 | 2.8 | 0.36 | | **2.75** |
| 12 | EL-A027158 | rhizoc - SR | self sterile | IC-1 | **3.75** | 5.00 | 9.8 | **6.6** | **0.68** | | **3.33** |
| 13 | EL-A029686 | SF"A" | SF | IC-1 | 4.25 | 5.25 | 12.4 | 4.2 | 0.34 | | 5.00 |
| 14 | EL-A029704 | SR98/2 | self sterile | IC-1 | 3.75 | 5.25 | 8.0 | 2.6 | 0.38 | | **2.58** |
| 15 | EL-A029768 | EL59 | self sterile | IC-2 | 5.00 | 6.00 | 15.6 | 3.2 | 0.18 | | **4.00** |
| 16 | EL-A029769 | EL61 | self sterile | IC-3 | 5.33 | 6.33 | 7.2 | 1.0 | 0.15 | | 5.25 |
| 17 | EL-A029770 | EL62 | self sterile | IC-4 | 4.30 | 5.20 | 13.0 | 4.2 | 0.49 | | 4.83 |
| 18 | EL-A12-00003 | SR98 x SF | SF | IC-1 | 4.00 | 5.00 | 7.4 | 4.6 | **0.63** | | 4.08 |
| 19 | EL-A12-00004 | rhizoc, nema | self sterile | IC-1 | 4.50 | 5.00 | 13.1 | 5.3 | 0.45 | | **3.50** |
| 20 | EL-A12-00018 | 2011 Rhizoctonia Selections | self sterile | IC-1 | 4.25 | 5.00 | 16.8 | **7.9** | 0.49 | | **1.67** |
| 21 | EL-A13-03848 | EL RHIZOC | segregating | IC-1 | **3.75** | **4.75** | 4.0 | 1.0 | 0.32 | | 5.00 |
| 22 | EL-A1402159 | NIC Storage&SR Rhiz (Grp 7&8) | self sterile | IC-1 | 4.25 | 5.25 | 13.3 | **8.3** | **0.65** | | **3.58** |
| 23 | EL-A1402161 | NIC Nematode Sucrose group | self sterile | IC-1 | 4.50 | 5.50 | 10.0 | 4.5 | 0.48 | | 4.33 |
| 24 | EL-A1402162 | Cercospora (Grp 1) | self sterile | IC-1 | 4.00 | 5.25 | 13.4 | 5.6 | 0.41 | | 4.08 |
| 25 | EL-A1402163 | NSCR (Grp 4) | self sterile | IC-1 | 4.00 | 5.25 | 11.1 | **6.6** | **0.65** | | **3.42** |
| 26 | EL-A15-00005 | storage | self sterile | IC-4 | **3.75** | **4.75** | 14.3 | **9.3** | **0.77** | | **2.83** |
| 27 | EL-A15-00006 | SR102 | self sterile | IC-4 | 4.25 | 5.25 | 15.0 | **8.0** | **0.54** | | **2.17** |
| 28 | EL-A15-01095 | elites (EL50;storage;rhizoc;suc;nema) x wilds | self sterile | IC-1 | 3.90 | **4.70** | 5.8 | 2.3 | 0.45 | | **4.00** |
| 817 | EL-A021482 | EL50/2 (Cercospora resistant) | self sterile | source | 3.00 | 4.25 | na | na | na | Resistant | 2.75 |
| 818 | EL-A1402166 | Fargo Cerc Susceptible check | self sterile | source | 5.75 | 6.75 | | | | Mod. Suceptible | 7.42 |
| Mean | | | | | 4.38 | 5.37 | 12.07 | 5.69 | 0.508 | | 3.92 |
| F test | | | | | 5.7*** | 5.7*** | 4.79*** | 5.49*** | 2.29** | | nd |
| LSD 0.05 | | | | | 0.76 | 0.70 | 7.18 | 1.86 | 0.19 | | 1.26 |
| CV | | | | | 17.78 | 13.32 | | | | | 17.15 |

to obtain the highest levels of resistance. This has been a problem for over a century and thus new approaches are needed. Accepting that Cercospora leaf spot as a continuing problem, identifying genotypes that yield well under disease pressure, rather than genotypes that simply manifest leaf spot, was of interest in harvesting the Cercospora trial. In all instances, Cercospora reduced White Sugar Yield in this test, by an average of 37%, Table 1). However, there was a wide range in the loss due to Cercospora (3.6 to 61%), suggesting that it may be possible to limit the effect of infection on sucrose production and recovery. There appeared to be little correlation between genetic resistance and sugar yield, at this level of analysis, with a correlation coefficient $r = 0.04$ between the September 7 Cercospora rating and WSY in the Cercospora nursery, and $r = 0.23$ with the same Cercospora rating and WSY in the Agronomic trial. Similarly, non-significant WSY paired t-tests were found between entries in diseased and non-diseased trials and their Cercospora ratings. Intuitively, this does not conform to dogma, and it may be useful to examine this question in more detail. It should be emphasized that these observations are exploratory and preliminary. Cursory examinations suggest that regrowth, or lack thereof, has a more marked effect on retention of sucrose in untreated fields than does the level of infection. In this case, a variety with good leaf spot resistance that does not show high levels of regrowth after defoliation by Cercospora may be one approach in limiting economic losses.

Many of the entries in the replicated East Lansing test showed good disease performance ratings, particularly related to Aphanomyces where 14 (50%) were not significantly different than the highly resistant Betaseed check entry, and no entry was as susceptible as the moderately susceptible check (Table 1). This observation suggests the breeding strategies deployed by East Lansing have been conservative relative to the disease packages of traditional breeding materials while increasing performance in other areas, since no direct conscious selection for Aphanomyces resistance has been performed on these materials since the 1970's. Seedling Rhizoctonia has been recognized as a problem more recently and few genetic materials have been developed to meet this challenge. One approach has been to inoculate early and judge stand persistence, and this approach seems promising. However, such a measure also likely depends on seedling vigor and emergence, and thus there are numerous confounding issues in seedling Rhizoctonia field trials. Among entries in the replicated East Lansing trial, the average stand persistence over the full season was just about 50% (Table 1), and anything above 50% was deemed statistically significant. Eight of the 28 entries (29%) met this mark, with one entry (#26) retaining 77% of initial stand. This entry also had good Cercospora tolerance, reasonable yield under both inoculated and non-inoculated Cercospora regimes, but lower sugar content than desirable, which depressed its white sugar yield (Table 1). Entry 26 (aka E1880) was developed as a long-term storage selection from material similar to the recently released SR102, and is a good potential germplasm release in the near future.

Breeding is expansive, meaning that there are usually more genotypes that can be assembled than there is room to test them all. In order to eliminate poorly performing genotypes, smaller disease reaction observation plots are used for East Lansing screening, often replicated but in a non-random fashion. Results from Cercospora (Table 2) and seedling Rhizoctonia (Table 3) observation trials reveal a great deal of variability. As mentioned above, there has not been observed any germplasm with greater resistance than EL50/2 (Entry 817) in Michigan since its release in 1994, despite over 1,000 genotypes being tested since then. Inbreds developed from EL50/2 with good, but not better, Cercospora resistance (e.g. Entries 822, 825, 834; Table 2) suggest that its genetic contributions can be dissected by comparing their genetic constitution

with siblings with poor Cercospora resistance (e.g. Entries 826, 829, 831, 836, 843; Table 1), which is in progress.

Seedling Rhizoctonia screening is not well established, and there are few genotypes that have sufficient evidence for resistance. EL51 is where seedling resistance was discovered, and from that, SR98 and SR98/2 were developed. From comparisons within these entries (or their progeny; Entries 37 and 40; Table 3), retention of up to 80% of original stand is the best that is possible. [It is noted that the soil type in which this test was conducted is not the best for good emergence, and thus a secondary aspect of this trial was to rate seedling vigor.] Highlighted in bold are entries with 75% or better stand persistence (Table 3), of which some likely have inherited the trait through SR98. Entries that exceed 100% (italics in Table 3) may have had slower germination and still be resistant, however the interpretation of these data is more problematic. None of the seedling Rhizoctonia inoculated materials were taken to harvest.

Finally, a population of recombinant inbred lines (RILs) was examined for sugar content. It seems appropriate to understand the genetics of sucrose accumulation since this is the primary economic reason for sugar beet, but surprisingly this is not well understood. The RIL population tested consisted of 95 lines derived from a single cross of C869 x L19/2 (i.e., the HSB6 population), derived by single seed descent to the F6 generation. C869 is a common seed parent in the series of RILs developed with different pollen parents to dissect the genetics of primary agronomic traits needed for the Great Lakes growing regions. L19/2 is a high sugar, 'Polish-type' germplasm developed from the Logan UT program, and was used extensively in the analysis of higher sugar content. Seed production from single plants (e.g. RILs) yields a nominal amount of seed, thus only a single plot of each of the 95 lines was tested. Four plots each of C869 and L19/2 parents were used to gauge variability in response, but not necessarily statistically significant differences between RILs. Since the plants are inbreds, only a single root was evaluated per plot. These adjustments are needed in order to obtain preliminary estimates in preparation for more extensive testing in the future, that is, to identify more promising genotypes where by the expensive process of seed increase would be likely to yield the greatest insights. Sugar content was estimated with NIR at the Michigan Sugar Research Lab (as were all sugars from the Agronomic trials, and the assistance of Michigan Sugar personnel is very much appreciated).

Table 4 shows sugars and purities as estimated via NIR for the HSB6 population and its parental accessions. Sugar content, but not purity, was significantly different between C869 and L19/2 (13.56% sugar vs. 20.45%, respectively, $LSD_{0.05}$ = 3.20%). Sugar content in L19/2 was likely among the highest sugars recorded in Michigan in 2016, and none of the HSB6 RILs exceeded this value, but 18 of the lines were not significantly different than L19/2, using the LSD value calculated between C869 and L19/2 (bold type in Table 4). Most (76%) RILs entries were not significantly different than C869, using the same LSD assumption (italics in Table 4). Thus, significant genetic variation appears to be present in the HSB6 population for sugar content that, suggesting this population could be used for a more in depth assessment of sugar content in beets, including a genomic analysis that would ideally pinpoint genes and chromosomal regions involved in the expression of sugar content in beets.

**Table 2**: East Lansing breeding entries to the Cercospora leaf spot trial at SVREC in 2016. Bold indicates not significantly different than the resistant check EL50/2. Scheme indicates breeding approach with the germplasm either being self-sterile (self-incompatible) or self-fertile (SF). Generation indicates progress state of germplasm with the number indicating the specific generation. IC = inter-crossed, F = filial (selfed, inbred). An 'x' in the name indicates a cross.

| Entry | Accession | Name | Scheme | Generation | Mean (9-6-16) |
|---|---|---|---|---|---|
| 817 | EL-A021482 | EL50/2 | self sterile | source | 3.55 |
| 793 | EL-A13-02337 | 2012CERCPl#3 | self sterile | IC-1 | 4.00 |
| 808 | EL-A1401664 | Y2O(F5)x | SF | F1 | 4.00 |
| 822 | EL-A022827 | CRB-065-02 | SF | F-4 | 4.00 |
| 825 | EL-A024368 | CRB-151-01 | SF | F-4 | 4.00 |
| 834 | EL-A024377 | CRB-162-01 | SF | F-4 | 4.00 |
| 853 | EL-A13-02349 | [C869 CMS x 2003 Old Soils) x 2007 5E] x New Rhiz | SF | F1 | 4.00 |
| 854 | EL-A13-02406 | RIA5x | SF | F1 | 4.00 |
| 856 | EL-A13-02306 | C869 cms x (Rhizoc-Rhizopus) | SF | F1 | 4.00 |
| 864 | EL-A15-01073 | SP7322x | SF | F1 | 4.00 |
| 906 | EL-A12-00035 | Fus 221 | self sterile | IC-n | 4.14 |
| 907 | EL-A12-00036 | Fus 227 | self sterile | IC-n | 4.14 |
| 908 | EL-A13-03847 | RIA5x | SF | IC-1 | 4.29 |
| 789 | EL-A12-00029 | 1108xx - PI's 2011 Cerc nurs | self sterile | IC-1 | 4.33 |
| 814 | EL-A1402123 | Y2O(F5)x | SF | F1 | 4.33 |
| 872 | EL-A15-00003 | SP7322 | self sterile | IC-1 | 4.33 |
| 912 | EL-A029711 | Cerc - from broad mix (EL) | self sterile | IC-1 | 4.43 |
| 821 | EL-A023164 | CRB-042-03 | SF | F-4 | 4.50 |
| 863 | EL-A15-00044 | C869x | SF | F1 | 4.50 |
| 865 | EL-A15-01072 | C869msd-C607-op | SF | BC-1 | 4.50 |
| 893 | EL-A019298 | 2005 Group C | self sterile | IC-1 | 4.50 |
| 890 | EL-A022469 | SR RZM Rhizoc B IC | self sterile | IC-1 | 4.57 |
| 903 | EL-A1402164 | Rhizoc (Grp 6) | self sterile | IC-1 | 4.57 |
| 806 | EL-A1401303 | Y2O(F5)x | SF | F1 | 4.67 |
| 809 | EL-A1401666 | Y2O(F5)x | SF | F1 | 4.67 |
| 879 | EL-A15-01037 | HSI5x | SF | F1 | 4.67 |
| 881 | EL-A1401461 | SP7322 cold sel | self sterile | IC-3 | 4.67 |
| 899 | EL-A12-00009 | SR98 x Cerc | self sterile | IC-1 | 4.71 |
| 905 | EL-A15-01094 | HSI5x | SF | IC-1 | 4.71 |
| 911 | EL-A029004 | M1-3 | self sterile | IC-4 | 4.71 |
| 918 | EL-A12-00002 | SF"B3" | SF | IC-1 | 4.77 |
| 896 | EL-A029733 | CRC4 x SR98 | SF | IC-1 | 4.86 |
| 898 | EL-A12-00019 | 2011 offsite mix selections | self sterile | IC-1 | 4.86 |
| 891 | EL-A022426 | C40 high sucrose x SR & Logan (Manbo HS donor) | self sterile | IC-1 | 4.90 |
| 954 | EL-A1402169 | Rhubarb Swiss Chard | self sterile | source | 4.92 |
| 955 | EL-A15-00008 | Petiole Chard | self sterile | IC-1 | 4.96 |
| 40 | EL-A12-00030 | EL51 | self sterile | IC-n | 5.00 |
| 795 | EL-A1401307 | Y03.5x | SF | F1 | 5.00 |
| 801 | EL-A1400706 | Y2O(F5)x | SF | F1 | 5.00 |
| 802 | EL-A1400754 | Y2O(F5)x | SF | F1 | 5.00 |
| 819 | EL-A023183 | CRA4.1 | SF | F-4 | 5.00 |
| 823 | EL-A022915 | CRB-065-01 | SF | F-4 | 5.00 |
| 824 | EL-A022928 | CRB-122-05 | SF | F-4 | 5.00 |
| 842 | EL-A024389 | CRB-197-04 | SF | F-4 | 5.00 |
| 846 | EL-A13-02250 | HSI04x | SF | F1 | 5.00 |
| 847 | EL-A13-02327 | C869cms x 2006-31D (elite - low water) | SF | F1 | 5.00 |
| 848 | EL-A13-02275 | C869 cms x (Rhizoc-Rhizopus) | SF | F1 | 5.00 |
| 850 | EL-A13-02260 | new Rhizoc | SF | F1 | 5.00 |
| 852 | EL-A13-02259 | C869CMS x 08-24A (SR98)x | SF | F1 | 5.00 |
| 859 | EL-A1400762 | 5A | SF | F1 | 5.00 |
| 860 | EL-A15-01065 | C869xSP7322 | SF | F1 | 5.00 |
| 862 | EL-A027001 | C842 CMS x SR98f2 | SF | F1 | 5.00 |
| 867 | EL-A15-01074 | C869x | SF | F1 | 5.00 |
| 868 | EL-A15-01071 | HSI5x | SF | F1 | 5.00 |
| 876 | EL-A15-01070 | HSI5x | SF | F1 | 5.00 |
| 884 | EL-A1401300 | cold sel IC - Bay City nema | self sterile | IC-1 | 5.00 |
| 914 | EL-A1401465 | SR98 slns | self sterile | IC-1 | 5.00 |
| 916 | EL-A15-00007 | HSI5x | SF | F1 | 5.09 |
| 787 | EL-A029709 | 2012-Entry 1881 | self sterile | IC | 5.14 |
| 894 | EL-A029731 | C842cms x 07-5E (nematode)x | SF | IC-1 | 5.14 |
| 904 | EL-A15-01069 | C869msd-C607-op | SF | BC-1 | 5.14 |
| 910 | EL-A13-03845 | 2012 slns SFx | SF | IC-1 | 5.14 |
| 895 | EL-A029732 | CRC4 x SR98 | SF | IC-1 | 5.29 |
| 902 | EL-A12-00026 | overwintered B from 2011 | SF | IC-1 | 5.29 |
| 790 | EL-A021503 | 03B Wild IC | self sterile | IC-1 | 5.33 |
| 791 | EL-A1402160 | Cerc PI's (Grp 5) | self sterile | IC-1 | 5.33 |
| 803 | EL-A1401285 | Y2O(F5)x | SF | F1 | 5.33 |
| 805 | EL-A1401294 | Y2O(F5)x | SF | F1 | 5.33 |
| 811 | EL-A1401670 | Y2O(F5)x | SF | F1 | 5.33 |
| 870 | EL-A15-01067 | C869xSP7322 | SF | F1 | 5.33 |
| 871 | EL-A15-01084 | C869xSP7322 | SF | F1 | 5.33 |
| 873 | EL-A15-00855 | C869x | SF | F1 | 5.33 |
| 886 | EL-A1401306 | CN027-202x cold sel | self sterile | IC-2 | 5.33 |
| 888 | EL-A021506 | Mic SR98+rhizomania | self sterile | IC-1 | 5.43 |
| 897 | EL-A029736 | CRC4 x SR98 | SF | IC-1 | 5.43 |
| 900 | EL-A12-00001 | New Rhizoc mix | SF | IC-1 | 5.43 |
| 820 | EL-A023202 | CRA4.2 | SF | F-4 | 5.50 |
| 827 | EL-A024370 | CRB-151-03 | SF | F-4 | 5.50 |
| 838 | EL-A024381 | CRB-175-02 | SF | F-4 | 5.50 |
| 845 | EL-A1400762 | C869 x FC607 | SF | F1 | 5.50 |
| 858 | EL-A1401447 | 5B | SF | F1 | 5.50 |
| 883 | EL-A1401298 | cold sel IC - SR98sel | self sterile | IC-1 | 5.50 |
| 885 | EL-A1401304 | cold sel IC - SP7322 | self sterile | IC-1 | 5.50 |
| 887 | EL-A1401467 | SR98x cold sln | self sterile | IC-1 | 5.55 |
| 901 | EL-A12-00027 | overwinter Kid population from 2011 | SF | IC-1 | 5.57 |
| 909 | EL-A15-00002 | mix C869xFC607 F2's mostly | mixed | IC-1 | 5.57 |
| 913 | EL-A1401463 | FC607 | self sterile | IC-1 | 5.57 |
| 796 | EL-A1402136 | Y03.5x | SF | F1 | 5.67 |
| 798 | EL-A1400547 | Y2O(F5)x | SF | F1 | 5.67 |
| 799 | EL-A1400554 | Y2O(F5)x | SF | F1 | 5.67 |
| 813 | EL-A1402018 | Y2O(F5)x | SF | F1 | 5.67 |
| 878 | EL-A15-01016 | HSI5x | SF | F1 | 5.67 |
| 880 | EL-A1401462 | Bay City nema cold sel | self sterile | IC-4 | 5.67 |
| 889 | EL-A013493 | SR98/cerc sel | self sterile | IC-1 | 5.71 |
| 892 | EL-A021744 | Low water elites | self sterile | IC-2 | 5.71 |
| 919 | EL-A15-00009 | CRB6 OP | SF | IC-1 | 5.73 |
| 788 | EL-A015033 | USH20 | genetic | self sterile | 5.82 |
| 797 | EL-A1400542 | Y2O(F5)x | SF | F1 | 6.00 |
| 800 | EL-A1400565 | Y2O(F5)x | SF | F1 | 6.00 |
| 804 | EL-A1401290 | Y2O(F5)x | SF | F1 | 6.00 |
| 807 | EL-A1401383 | Y2O(F5)x | SF | F1 | 6.00 |
| 810 | EL-A1401668 | Y2O(F5)x | SF | F1 | 6.00 |
| 815 | EL-A1402139 | Y2O(F5)x | SF | F1 | 6.00 |
| 830 | EL-A024373 | CRB-155-03 | SF | F-4 | 6.00 |
| 832 | EL-A024375 | CRB-160-02 | SF | F-4 | 6.00 |
| 835 | EL-A024378 | CRB-162-02 | SF | F-4 | 6.00 |
| 837 | EL-A022852 | CRB-164-01 | SF | F-4 | 6.00 |
| 841 | EL-A024387 | CRB-197-01 | SF | F-4 | 6.00 |
| 844 | EL-A024393 | CRB3x | SF | F1 | 6.00 |
| 855 | EL-A13-03859 | HSI04x | SF | F1 | 6.00 |
| 857 | EL-A13-03860 | HSI04x | SF | F1 | 6.00 |
| 861 | EL-A15-01066 | C869xSP7322 | SF | F1 | 6.00 |
| 866 | EL-A15-01063 | C869x | SF | F1 | 6.00 |
| 869 | EL-A1400308 | FC607 | self sterile | F1 | 6.00 |
| 877 | EL-A15-01007 | C869x | SF | F1 | 6.00 |
| 882 | EL-A1401296 | cold sel IC - SR98x | self sterile | IC-1 | 6.00 |
| 915 | EL-A1401460 | C869 x cold sel | SF | IC-1 | 6.00 |
| 917 | EL-A024965 | Germ test slns (salt w/ SR) | self sterile | IC-1 | 6.02 |
| 792 | EL-A13-02263 | 12B63-05 | self sterile | IC-1 | 6.33 |
| 812 | EL-A1402017 | Y2O(F5)x | SF | F1 | 6.33 |
| 874 | EL-A15-01064 | C869x | SF | F1 | 6.33 |
| 828 | EL-A022951 | CRB-153-01 | SF | F-4 | 6.50 |
| 833 | EL-A024376 | CRB-160-03 | SF | F-4 | 6.50 |
| 840 | EL-A024385 | CRB-189-02 | SF | F-4 | 6.50 |
| 794 | EL-A1400593 | Y03.5x | SF | F1 | 6.67 |
| 875 | EL-A15-01068 | HSI5x | SF | F1 | 6.67 |
| 940 | EL-A16-0001 | F1042 Cerc Susc | self sterile | source | 6.75 |
| 818 | EL-A1402166 | Fargo Cerc Susc check | self sterile | source | 6.80 |
| 826 | EL-A024369 | CRB-151-02 | SF | F-4 | 7.00 |
| 829 | EL-A024372 | CRB-155-02 | SF | F-4 | 7.00 |
| 831 | EL-A024374 | CRB-160-01 | SF | F-4 | 7.00 |
| 836 | EL-A024379 | CRB-162-03 | SF | F-4 | 7.00 |
| 839 | EL-A024384 | CRB-189-01 | SF | F-4 | 7.00 |
| 843 | EL-A024392 | CRB-199-03 | SF | F-4 | 7.00 |
| | | | | Grand mean | 5.17 |
| | | | | F-statistic | 10.63*** |
| | | | | LSD 0.05 | 0.87 |

**Table 3**: East Lansing breeding entries to the Seedling Rhizoctonia trial at SVREC in 2016. Bold indicates not significantly different than the resistant checks EL51 and SR98/2. Scheme and Generation as per Table 2.

Data are stand counts taken on specific dates, with the proportion surviving on the final date indicated as final stand divided by initial stand. Values above 1.0 indicate final stand was greater than initial stand, and has been observed previously in Rhizoctonia Crown and Root Rot resistant USDA germplasm release FC708 (not trialed here). This test was conducted primarily to evaluate seedling vigor and initial stand establishment in non-irrigated, sub-optimal conditions (e.g., a soil type with higher sand content), and secondarily to gain experience with seedling Rhizoctonia field inoculation and selection. Plants were inoculated at the 2 to 4-leaf stage, ideally, however there was a wide range of variation in plant growth stage at this time. It is apparent there are wide differences, likely with many causes, and suggests there is a heritable component to seed Rhizoctonia resistance.

| Entry | Accession | Name | Scheme | Generation | Stand Jun8 | Stand Oct4 | Oct4/Jun8 |
|---|---|---|---|---|---|---|---|
| 29 | EL-A019298 | 2005 Group C | self sterile | IC-1 | 4.8 | 1.3 | 0.40 |
| 30 | EL-A022404 | 05 rhizoc sel mix | segregating | IC-1 | 7.6 | 2.3 | 0.47 |
| 31 | EL-A022469 | SR RZM Rhizoc B IC | self sterile | IC-1 | 18.8 | 9.1 | 0.58 |
| 32 | EL-A024961 | rhizoc / salt tol group | self sterile | IC-1 | 14.6 | 4.6 | 0.35 |
| 33 | EL-A024967 | storage | self sterile | IC-1 | 13.1 | 8.0 | 0.80 |
| 34 | EL-A024968 | SR98 x SR / Sucrose / etc | self sterile | IC-1 | 14.4 | 8.3 | 0.62 |
| 35 | EL-A027006 | SR98/2 | self sterile | IC-3 | 19.9 | 12.9 | 0.76 |
| 36 | EL-A027015 | New Rhizoc | self sterile | IC-1 | 10.6 | 2.4 | 0.31 |
| 37 | EL-A029715 | SR98/2x | self sterile | IC-1 | 13.5 | 9.4 | 0.80 |
| 39 | EL-A12-00001 | New Rhizoc mix | SF | IC-1 | 14.4 | 6.9 | 0.46 |
| 40 | EL-A12-00030 | EL51 | self sterile | IC-n | 17.3 | 11.0 | 0.77 |
| 41 | EL-A12-00036 | Fus 227 | self sterile | IC-n | 7.6 | 2.1 | 0.34 |
| 42 | EL-A13-03847 | RIA5x | SF | IC-1 | 7.9 | 3.1 | 0.34 |
| 43 | EL-A1401296 | cold sel IC - SR98x | self sterile | IC-1 | 20.0 | 4.6 | 0.23 |
| 44 | EL-A1401465 | SR98 slns | self sterile | IC-1 | 22.0 | 12.3 | 0.57 |
| 45 | EL-A1401467 | SR98x cold sln | self-sterile | IC-1 | 15.4 | 4.4 | 0.35 |
| 46 | EL-A15-00003 | SP7322 | self sterile | IC-1 | 15.4 | 5.0 | 0.34 |
| 47 | EL-A025747 | CR84x | SF | F-2 | 27.0 | 0.0 | 0.00 |
| 48 | EL-A025889 | CR84x | SF | F-2 | 8.5 | 7.0 | 0.81 |
| 49 | EL-A026000 | CR84x | SF | F-2 | 6.0 | 4.0 | 0.71 |
| 50 | EL-A026103 | CR84x | SF | F-2 | 20.5 | 2.0 | 0.09 |
| 51 | EL-A026124 | CR84x | SF | F-2 | 14.5 | 11.0 | 0.73 |
| 52 | EL-A026268 | CR84x | SF | F-2 | 14.0 | 7.5 | 0.64 |
| 53 | EL-A026277 | CR84x | SF | F-2 | 19.5 | 9.5 | 0.49 |
| 54 | EL-A026376 | CR84x | SF | F-2 | 19.0 | 9.5 | 0.54 |
| 55 | EL-A026453 | CR84x | SF | F-2 | 8.0 | 4.0 | 0.50 |
| 56 | EL-A026507 | CR84x | SF | F-2 | 8.0 | 3.0 | 0.23 |
| 57 | EL-A026508 | CR84x | SF | F-2 | 18.5 | 6.5 | 0.37 |
| 58 | EL-A026509 | CR84x | SF | F-2 | 26.0 | 18.0 | 0.69 |
| 59 | EL-A026515 | CR84x | SF | F-2 | 10.5 | 4.5 | 0.50 |
| 60 | EL-A026559 | CR84x | SF | F-2 | 14.5 | 3.5 | 0.25 |
| 61 | EL-A026583 | CR84x | SF | F-2 | 24.0 | 13.5 | 0.57 |
| 62 | EL-A026594 | CR84x | SF | F-2 | 26.0 | 8.5 | 0.32 |
| 63 | EL-A026598 | CR84x | SF | F-2 | 12.5 | 3.5 | 0.31 |
| 64 | EL-A026600 | CR84x | SF | F-2 | 8.0 | 1.5 | 0.18 |
| 65 | EL-A026604 | CR84x | SF | F-2 | 14.0 | 9.5 | 0.76 |
| 66 | EL-A026605 | CR84x | SF | F-2 | 14.5 | 8.0 | 0.54 |
| 67 | EL-A026606 | CR84x | SF | F-2 | 12.5 | 3.0 | 0.23 |
| 68 | EL-A026635 | CR84x | SF | F-2 | 9.0 | 5.5 | 0.61 |
| 69 | EL-A026640 | CR84x | SF | F-2 | 12.0 | 3.0 | 0.31 |
| 70 | EL-A026683 | CR84x | SF | F-2 | 6.5 | 1.5 | 0.25 |
| 71 | EL-A026693 | CR84x | SF | F-2 | 7.5 | 2.0 | 0.26 |
| 72 | EL-A026699 | CR84x | SF | F-2 | 15.5 | 10.0 | 0.64 |
| 73 | EL-A026708 | CR84x | SF | F-2 | 8.0 | 6.5 | 0.95 |
| 74 | EL-A026710 | CR84x | SF | F-2 | 3.0 | 0.0 | 0.00 |
| 75 | EL-A026711 | CR84x | SF | F-2 | 17.5 | 8.5 | 0.54 |
| 76 | EL-A026728 | CR84x | SF | F-2 | 11.0 | 8.0 | 0.73 |
| 77 | EL-A026746 | CR84x | SF | F-2 | 7.5 | 4.5 | 0.62 |
| 78 | EL-A026747 | CR84x | SF | F-2 | 13.0 | 1.0 | 0.08 |
| 79 | EL-A026748 | CR84x | SF | F-2 | 21.0 | 13.5 | 0.63 |
| 80 | EL-A026749 | CR84x | SF | F-2 | 7.0 | 6.0 | *1.28* |
| 81 | EL-A026753 | CR84x | SF | F-2 | 9.0 | 4.5 | 0.50 |
| 82 | EL-A026754 | CR84x | SF | F-2 | 15.5 | 7.0 | 0.45 |
| 83 | EL-A026755 | CR84x | SF | F-2 | 6.5 | 4.0 | 0.72 |
| 84 | EL-A026758 | CR84x | SF | F-2 | 9.0 | 1.0 | 0.13 |
| 85 | EL-A026768 | CR84x | SF | F-2 | 16.5 | 7.5 | 0.45 |
| 86 | EL-A026769 | CR84x | SF | F-2 | 11.5 | 7.5 | 0.65 |
| 87 | EL-A026770 | CR84x | SF | F-2 | 6.0 | 1.5 | 0.25 |
| 88 | EL-A026772 | CR84x | SF | F-2 | 6.5 | 1.0 | 0.22 |
| 89 | EL-A026774 | CR84x | SF | F-2 | 13.5 | 10.0 | 0.73 |
| 90 | EL-A026777 | CR84x | SF | F-2 | 3.0 | 1.5 | 0.63 |
| 91 | EL-A026780 | CR84x | SF | F-2 | 7.5 | 2.5 | 0.35 |
| 92 | EL-A026781 | CR84x | SF | F-2 | 12.0 | 4.5 | 0.38 |
| 93 | EL-A027038 | CR84x | SF | F-2 | 9.5 | 4.5 | 0.46 |
| 94 | EL-A027039 | CR84x | SF | F-2 | 8.0 | 3.0 | 0.43 |
| 95 | EL-A027040 | CR84x | SF | F-2 | 4.5 | 0.5 | 0.10 |
| 96 | EL-A027042 | CR84x | SF | F-2 | 5.0 | 2.5 | 0.58 |
| 97 | EL-A027043 | CR84x | SF | F-2 | 10.0 | 2.0 | 0.22 |
| 98 | EL-A027046 | CR84x | SF | F-2 | 1.5 | 0.5 | 0.50 |
| 99 | EL-A027047 | CR84x | SF | F-2 | 6.0 | 1.0 | 0.17 |
| 100 | EL-A027048 | CR84x | SF | F-2 | 15.0 | 8.5 | 0.54 |
| 101 | EL-A027049 | CR84x | SF | F-2 | 4.0 | 0.5 | 0.13 |
| 102 | EL-A027054 | CR84x | SF | F-2 | 7.5 | 1.5 | 0.30 |
| 103 | EL-A13-02262 | new Rhizoc | SF | F-2 | 7.0 | 4.0 | 0.65 |
| 104 | EL-A13-02268 | new Rhizoc | SF | F-2 | 1.5 | 1.0 | 0.50 |
| 105 | EL-A13-02299 | new Rhizoc | SF | F-2 | 9.5 | 0.5 | 0.03 |
| 106 | EL-A13-02370 | new Rhizoc | SF | F-2 | 4.0 | 0.0 | 0.00 |
| 107 | EL-A13-02378 | new Rhizoc | SF | F-2 | 5.5 | 3.0 | 0.48 |
| 108 | EL-A13-02405 | new Rhizoc | SF | F-2 | 13.0 | 4.0 | 0.26 |
| 109 | EL-A13-02300 | (EL51 F3 ms) - capture 07-33B | SF | F-2 | 11.5 | 1.5 | 0.13 |
| 110 | EL-A13-02340 | (EL51 F3 ms) - capture 07-33B | SF | F-2 | 13.0 | 2.5 | 0.21 |
| 111 | EL-A13-02372 | (EL51 F3 ms) - capture 07-33B | SF | F-2 | 14.0 | 0.5 | 0.07 |
| 112 | EL-A13-02379 | (EL51 F3 ms) - capture 07-33B | SF | F-2 | 2.0 | 3.0 | *2.33* |
| 113 | EL-A13-02253 | (EL51 F3 ms) x HS etc elites | SF | F-2 | 6.0 | 1.0 | 0.19 |
| 114 | EL-A13-02293 | (EL51 F3 ms) x HS etc elites | SF | F-2 | 5.5 | 2.5 | 0.47 |
| 115 | EL-A13-02295 | (EL51 F3 ms) x HS etc elites | SF | F-2 | 3.5 | 0.0 | 0.00 |
| 116 | EL-A13-02324 | (EL51 F3 ms) x HS etc elites | SF | F-2 | 11.5 | 0.5 | 0.03 |
| 117 | EL-A12-01449 | [(869 CMS x nematode)] x SR98/2 | SF | F-2 | 29.5 | 16.5 | 0.55 |
| 118 | EL-A12-01470 | [(869 CMS x nematode)] x SR98/2 | SF | F-2 | 15.0 | 12.5 | 0.89 |
| 119 | EL-A12-01471 | [(869 CMS x nematode)] x SR98/2 | SF | F-2 | 13.5 | 4.5 | 0.36 |
| 120 | EL-A12-01496 | [(869 CMS x nematode)] x SR98/2 | SF | F-2 | 12.0 | 3.5 | 0.38 |
| 121 | EL-A13-02359 | [(869 CMS x nematode)] x SR98/2 | SF | F-2 | 24.0 | 16.5 | 0.76 |
| 122 | EL-A13-02360 | [(869 CMS x nematode)] x SR98/2 | SF | F-2 | 4.5 | 9.0 | *2.83* |
| 123 | EL-A13-02364 | [(869 CMS x nematode)] x SR98/2 | SF | F-2 | 15.0 | 10.0 | 0.67 |
| 124 | EL-A13-02383 | [(869 CMS x nematode)] x SR98/2 | SF | F-2 | 9.0 | 6.5 | 0.67 |
| 126 | EL-A13-02278 | [(869 CMS x EL) x New Rhiz | SF | F-2 | 17.0 | 0.0 | 0.00 |
| 127 | EL-A13-02284 | C842 CMS x SR98/2 | SF | F-2 | 8.0 | 0.5 | 0.04 |
| 128 | EL-A13-02285 | C842 CMS x SR98/2 | SF | F-2 | 12.5 | 6.5 | 0.55 |
| 129 | EL-A13-02290 | C842 CMS x SR98/2 | SF | F-2 | 8.5 | 6.0 | *1.15* |
| 131 | EL-A13-02346 | C842 CMS x SR98/2 | SF | F-2 | 16.0 | 13.0 | 0.82 |
| 132 | EL-A13-02404 | C842 CMS x SR98/2 | SF | F-2 | 12.0 | 7.0 | 0.56 |
| 133 | EL-A13-03858 | C842 CMS x SR98/2 | SF | F-2 | 13.0 | 6.5 | 0.54 |
| 134 | EL-A13-02254 | C869 x (SR98 + nema + salt) | SF | F-2 | 16.0 | 1.0 | 0.06 |
| 135 | EL-A13-02323 | C869 x (SR98 + nema + salt) | SF | F-2 | 6.5 | 4.0 | *1.33* |
| 136 | EL-A13-02339 | C869 x (SR98 + nema + salt) | SF | F-2 | 16.0 | 4.0 | 0.37 |
| 137 | EL-A13-02355 | C869 x (SR98 + nema + salt) | SF | F-2 | 23.5 | 0.5 | 0.03 |
| 138 | EL-A13-02297 | C869CMS x 08-24A (SR98)x | SF | F-2 | 12.0 | 14.0 | *1.11* |
| 139 | EL-A12-01898 | CR84 capture 08-24A (SR98) | SF | F-3 | 12.0 | 2.5 | 0.27 |
| 140 | EL-A12-01755 | CR84 capture 08-24A (SR98) | SF | F-3 | 8.0 | 2.5 | 0.33 |
| 141 | EL-A12-01770 | CR84 capture 08-24A (SR98) | SF | F-3 | 16.5 | 14.0 | 0.80 |
| 142 | EL-A12-01819 | CR84 capture 08-24A (SR98) | SF | F-3 | 14.0 | 9.5 | 0.75 |
| 143 | EL-A12-01892 | CR84 capture 08-24A (SR98) | SF | F-3 | 8.0 | 4.0 | 0.54 |
| 144 | EL-A12-01894 | CR84 capture 08-24A (SR98) | SF | F-3 | 15.0 | 14.5 | 0.98 |
| 145 | EL-A12-01896 | CR84 capture 08-24A (SR98) | SF | F-3 | 8.5 | 14.0 | 8.84 |
| 146 | EL-A12-01903 | CR84 capture 08-24A (SR98) | SF | F-3 | 25.0 | 12.0 | 0.50 |
| 147 | EL-A12-01905 | CR84 capture 08-24A (SR98) | SF | F-3 | 11.5 | 6.5 | 0.65 |
| 148 | EL-A12-01907 | CR84 capture 08-24A (SR98) | SF | F-3 | 6.0 | 9.0 | *1.60* |
| 149 | EL-A12-01910 | CR84 capture 08-24A (SR98) | SF | F-3 | 14.0 | 6.0 | 0.52 |
| 150 | EL-A12-01911 | CR84 capture 08-24A (SR98) | SF | F-3 | 9.0 | 0.0 | 0.00 |
| 151 | EL-A12-01912 | CR84 capture 08-24A (SR98) | SF | F-3 | 23.5 | 5.0 | 0.18 |
| 152 | EL-A12-01914 | CR84 capture 08-24A (SR98) | SF | F-3 | 7.0 | 3.5 | 0.50 |
| 883 | EL-A1401298 | cold sel IC - SR98sel | self sterile | IC-1 | 23.6 | 9.6 | 0.42 |
| 884 | EL-A1401300 | cold sel IC - Bay City nema | self sterile | IC-1 | 14.7 | 2.6 | 0.20 |
| 885 | EL-A1401304 | cold sel IC - SP7322 | self sterile | IC-1 | 16.6 | 5.4 | 0.46 |
| 926 | EL-A022776 | EL64 | self sterile | IC-1 | 16.0 | 2.0 | 0.13 |
| 928 | EL-A1400815 | Red beet | SF | F-7 | 3.0 | 5.0 | *1.67* |
| 929 | EL-A1400505 | Red beet | SF | F-7 | 19.0 | 1.0 | 0.05 |
| 930 | EL-A1400036 | Red beet | SF | F-7 | 15.0 | 11.0 | 0.73 |
| 932 | EL-A1401359 | Red beet | SF | F-7 | 1.0 | 0.0 | 0.00 |
| | | mean | | | 13.36 | 6.50 | 0.57 |
| | | F value | | | 2.43*** | 4.86*** | 2.36*** |
| | | LSD 0.05 | | | 13.07 | 6.80 | 1.54 |

**Table 4**: Sugar analysis of the HSB6 recombinant inbred population. Single roots from single plots of 95 lines repeatedly selfed over six generations via single seed descent from a cross between C896 (average sugar content) and L19/2 (high sugar content) were tested for variation in sugar content by NIR (via Michigan Sugar Coop), and compared with their parental accessions (replicated four times to obtain a comparison statistic). Entries are sorted by sugar content. Italics suggest entries not significantly different from the lower sugar parent C869 and bold suggests entries not significantly different from the higher sugar parent L19/2.

| Entry # | N Reps | Accession | Name | Sugar % | Purity % |
|---|---|---|---|---|---|
| 195 | 1 | EL-A15-00831 | HSB-108-05-02-2 | *10.19* | 91.75 |
| 184 | 1 | EL-A15-00880 | HSB-102-02-01-3 | *11.32* | 94.13 |
| 231 | 1 | EL-A15-00916 | HSB-185-05-01-13 | *11.41* | 94.42 |
| 183 | 1 | EL-A15-00824 | HSB-102-02-01-1 | *11.44* | 95.06 |
| 215 | 1 | EL-A15-01021 | HSB-160-03-01-1 | *11.61* | 93.90 |
| 221 | 1 | EL-A15-01015 | HSB-163-02-02-5 | *12.15* | 95.94 |
| 225 | 1 | EL-A15-00833 | HSB-176-01-05-10 | *12.24* | 92.94 |
| 218 | 1 | EL-A15-00996 | HSB-160-03-05-1 | *12.40* | 94.94 |
| 205 | 1 | EL-A15-00873 | HSB-144-04-02-10 | *12.45* | 93.82 |
| 227 | 1 | EL-A15-00909 | HSB-176-01-05-14 | *12.85* | 95.18 |
| 185 | 1 | EL-A15-00885 | HSB-102-02-01-5 | *12.87* | 93.74 |
| 189 | 1 | EL-A15-00989 | HSB-106-02-03-4 | *12.92* | 95.04 |
| 226 | 1 | EL-A15-00849 | HSB-176-01-05-11 | *12.94* | 93.55 |
| 245 | 1 | EL-A15-00960 | HSB-194-02-03-6 | *13.08* | 94.21 |
| 165 | 1 | EL-A15-01001 | HSB-066-02-05-4 | *13.19* | 95.33 |
| 203 | 1 | EL-A15-00917 | HSB-118-01-03-1 | *13.34* | 94.67 |
| 244 | 1 | EL-A15-00963 | HSB-194-02-03-4 | *13.48* | 94.96 |
| 1 | 4 | EL-A015027 | C869 CMS (check) | *13.56* | 96.12 |
| 202 | 1 | EL-A15-00866 | HSB-116-02-05-3 | *13.75* | 94.33 |
| 193 | 1 | EL-A15-00900 | HSB-108-01-01-1 | *13.78* | 94.62 |
| 213 | 1 | EL-A15-00923 | HSB-160-01-05-6 | *13.84* | 95.20 |
| 171 | 1 | EL-A15-01014 | HSB-089-03-04-1 | *13.92* | 94.34 |
| 249 | 1 | EL-A15-01033 | HSB-194-02-04-3 | *14.08* | 94.35 |
| 175 | 1 | EL-A15-00890 | HSB-090-01-04-1 | *14.13* | 95.51 |
| 220 | 1 | EL-A15-01003 | HSB-163-02-02-4 | *14.29* | 97.54 |
| 177 | 1 | EL-A15-00899 | HSB-091-01-03-1 | *14.33* | 95.07 |
| 186 | 1 | EL-A15-01028 | HSB-104-03-03-1 | *14.39* | 94.16 |
| 222 | 1 | EL-A15-00906 | HSB-167-01-02-3 | *14.43* | 96.84 |
| 237 | 1 | EL-A15-00973 | HSB-186-02-04-3 | *14.45* | 94.78 |
| 204 | 1 | EL-A15-01004 | HSB-118-01-05-1 | *14.73* | 97.53 |
| 211 | 1 | EL-A15-00910 | HSB-152-01-03-5 | *14.75* | 93.40 |
| 223 | 1 | EL-A15-00949 | HSB-168-02-03-1 | *14.78* | 94.96 |
| 196 | 1 | EL-A15-00974 | HSB-108-05-03-1 | *14.78* | 95.47 |
| 228 | 1 | EL-A15-00878 | HSB-176-01-05-2 | *14.80* | 95.27 |
| 236 | 1 | EL-A15-00951 | HSB-186-02-04-2 | *14.85* | 95.81 |
| 159 | 1 | EL-A15-00975 | HSB-031-03-05-1 | *15.06* | 95.73 |
| 197 | 1 | EL-A15-00982 | HSB-108-05-03-2 | *15.06* | 93.50 |
| 208 | 1 | EL-A15-00865 | HSB-144-04-02-4 | *15.23* | 94.41 |
| 251 | 1 | EL-A15-00836 | HSB-194-02-04-6 | *15.25* | 95.83 |
| 210 | 1 | EL-A15-00838 | HSB-145-02-05-1 | *15.33* | 95.38 |
| 214 | 1 | EL-A15-00985 | HSB-160-01-05-8 | *15.36* | 96.22 |
| 238 | 1 | EL-A15-00970 | HSB-186-02-05-2 | *15.36* | 96.60 |
| 182 | 1 | EL-A15-00918 | HSB-098-02-01-9 | *15.40* | 95.93 |
| 201 | 1 | EL-A15-00875 | HSB-116-02-05-1 | *15.47* | 94.45 |
| 229 | 1 | EL-A15-00843 | HSB-176-01-05-4 | *15.49* | 95.12 |
| 198 | 1 | EL-A15-00915 | HSB-108-05-03-4 | *15.49* | 95.41 |
| 250 | 1 | EL-A15-00867 | HSB-194-02-04-5 | *15.55* | 96.24 |
| 160 | 1 | EL-A15-01027 | HSB-031-05-01-1 | *15.55* | 96.71 |
| 190 | 1 | EL-A15-00860 | HSB-106-02-03-6 | *15.62* | 96.80 |
| 230 | 1 | EL-A15-00965 | HSB-185-05-01-10 | *15.68* | 96.13 |
| 232 | 1 | EL-A15-01002 | HSB-185-05-01-16 | *15.69* | 96.65 |
| 167 | 1 | EL-A15-00905 | HSB-083-04-01-1 | *15.79* | 97.28 |
| 169 | 1 | EL-A15-00904 | HSB-083-04-04-2 | *15.84* | 95.82 |
| 176 | 1 | EL-A15-00897 | HSB-090-01-04-2 | *15.91* | 95.68 |
| 246 | 1 | EL-A15-00851 | HSB-194-02-03-7 | *15.93* | 96.95 |
| 192 | 1 | EL-A15-00837 | HSB-106-02-03-9 | *15.99* | 95.73 |
| 187 | 1 | EL-A15-00921 | HSB-104-03-03-3 | *16.14* | 95.41 |
| 166 | 1 | EL-A15-00883 | HSB-066-02-05-5 | *16.14* | 96.08 |
| 247 | 1 | EL-A15-00840 | HSB-194-02-04-1 | *16.15* | 94.94 |
| 234 | 1 | EL-A15-00945 | HSB-185-05-01-5 | *16.25* | 96.06 |
| 254 | 1 | EL-A15-00954 | HSB6-n | *16.46* | 95.99 |
| 163 | 1 | EL-A15-01013 | HSB-066-02-05-1 | *16.46* | 96.85 |
| 212 | 1 | EL-A15-00911 | HSB-160-01-05-4 | *16.46* | 96.36 |
| 207 | 1 | EL-A15-00853 | HSB-144-04-02-3 | *16.47* | 96.13 |
| 217 | 1 | EL-A15-01012 | HSB-160-03-02-4 | *16.47* | 97.25 |
| 157 | 1 | EL-A15-00966 | HSB-015-02-03-3 | *16.50* | 96.83 |
| 172 | 1 | EL-A15-00932 | HSB-089-03-04-2 | *16.55* | 97.39 |
| 174 | 1 | EL-A15-00924 | HSB-090-01-01-1 | *16.59* | 96.06 |
| 155 | 1 | EL-A15-00979 | HSB-015-02-03-1 | *16.70* | 96.68 |
| 224 | 1 | EL-A15-00919 | HSB-176-01-01-1 | *16.73* | 95.40 |
| 156 | 1 | EL-A15-00908 | HSB-015-02-03-2 | *16.75* | 96.59 |
| 235 | 1 | EL-A15-00983 | HSB-186-02-03-1 | 16.85 | 97.45 |
| 181 | 1 | EL-A15-00912 | HSB-098-02-01-8 | 16.89 | 95.41 |
| 252 | 1 | EL-A15-00845 | HSB6-n | 16.96 | 96.11 |
| 194 | 1 | EL-A15-00850 | HSB-108-05-02-1 | 17.04 | 94.74 |
| 233 | 1 | EL-A15-01000 | HSB-185-05-01-18 | 17.15 | 97.01 |
| 199 | 1 | EL-A15-00942 | HSB-109-01-05-1 | 17.18 | 95.99 |
| 239 | 1 | EL-A15-00978 | HSB-186-02-05-3 | 17.22 | 96.33 |
| 180 | 1 | EL-A15-00881 | HSB-098-02-01-6 | **17.30** | 95.87 |
| 178 | 1 | EL-A15-00971 | HSB-098-02-01-12 | **17.32** | 96.42 |
| 200 | 1 | EL-A15-00947 | HSB-112-05-03-1 | **17.42** | 96.48 |
| 209 | 1 | EL-A15-00864 | HSB-144-04-02-7 | **17.46** | 96.07 |
| 168 | 1 | EL-A15-00913 | HSB-083-04-04-1 | **17.48** | 96.40 |
| 161 | 1 | EL-A15-00958 | HSB-031-05-01-2 | **17.53** | 97.68 |
| 219 | 1 | EL-A15-00997 | HSB-161-02-02-2 | **17.67** | 96.26 |
| 248 | 1 | EL-A15-00888 | HSB-194-02-04-2 | **17.71** | 95.88 |
| 242 | 1 | EL-A15-00874 | HSB-194-02-02-8 | **17.74** | 95.52 |
| 253 | 1 | EL-A15-00992 | HSB6-n | **17.74** | 96.88 |
| 162 | 1 | EL-A15-00868 | HSB-042-01-03-2 | **17.86** | 95.78 |
| 154 | 1 | EL-A15-00931 | HSB-009-02-04-1 | **18.11** | 96.46 |
| 241 | 1 | EL-A15-00925 | HSB-186-02-05-5 | **18.15** | 96.31 |
| 170 | 1 | EL-A15-01018 | HSB-087-01-03-1 | **18.24** | 96.66 |
| 158 | 1 | EL-A15-00968 | HSB-026-05-04-1 | **18.44** | 97.32 |
| 179 | 1 | EL-A15-00933 | HSB-098-02-01-2 | **18.48** | 96.88 |
| 188 | 1 | EL-A15-00964 | HSB-104-04-03-2 | **18.70** | 96.43 |
| 240 | 1 | EL-A15-00920 | HSB-186-02-05-4 | **18.94** | 97.82 |
| 920 | 4 | EL-A15-01005 | L19/2-ib (check) | **20.45** | 97.94 |
| | | | Mean | 15.58 | 95.78 |
| | | | * F-test | 27.76*** | 5.05ns |
| | | | * LSD 0.05 | 3.20 | 1.97 |

* Values determined from replicated checks 1 and 920

The following was extracted from the 2016 Plant Introduction trial submission to Plant Disease Management Reports (www.plantmanagementnetwork.org/pub/trial/pdmr/).

"Thirty Plant Introductions (PIs) from the USDA-ARS National Plant Germplasm System (NPGS) *Beta* Collection [includes garden beet, sugarbeet, leaf beet, fodder beet (*Beta vulgaris* L.), and wild beet (*Beta* spp.)] along with three entries resulting from crossing of previous years (2011-2014) PIs selected from Cercospora leaf spot tests (Hanson, et al. PDMR 8:FC170) with East Lansing germplasm were evaluated for resistance to *Cercospora beticola* in an artificially produced epiphytotic environment (based generally on Ruppel, E.G. and J.O. Gaskill. 1971. J. Am. Soc. Sugar Beet Technol. 16:384). Previous year's PIs were selected for their general levels of agronomic performance (e.g. emergence, stand persistence, and seed production) to augment genetic diversity in the cultivated germplasm pool and one, EL-A12-00029, was selected for Cercospora leaf spot performance. A randomized complete-block design, with three replications was used to evaluate germplasm at the Michigan State University Saginaw Valley Research and Extension Center (SVREC) near Frankenmuth, MI. The field had been planted in wheat with clover underseeded in 2014. Internal controls included a susceptible check, F1042 (PI 674103), and a resistant check, EL50/2 (PI 664912). Single-row plots 4.5 m long, with 51 cm between rows were planted on 6 May. 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 nursery was spray-inoculated on 5 Jul with a liquid spore suspension (approximately 1 x $10^3$ spores/ml as determined with a hemacytometer) of *C. beticola*. Inoculum was produced from a mixture of leaves collected from the 2015 inoculated leaf spot nursery at SVREC and naturally infected beets grown at SVREC and on the Michigan State University campus farms in East Lansing, MI. Visual evaluations of the plot with a disease index (DI) on a scale from 0-10 where 0=no symptoms, 1=a few scattered spots, 2=spots coalescing or in large numbers on lower leaves only, 3= some dieback on lower leaves, but leaves not entirely dead, 4-8 are increasing amounts of dead and diseased tissue, 9= mostly dead with few remaining living leaves with large dead patches, and 10=all leaves dead. Evaluations were made on 18, 23, and 30 Aug, and 6 Sep, with the peak of the epidemic occurring around 6 Sep. An evaluation was attempted subsequently, but several PIs were losing leaves 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 9 May, followed by 4 times with mixtures of phenmedipham, desmedipham, triflusulfuron methyl, and clopyralid (18 and 24 May and 10 and 21 Jun) and once with S-metolachlor (29 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 2016, combined with high humidity and limited rainfall, contributed to a moderate leaf spot epiphytotic. Supplemental moisture was applied using an overhead irrigation system 6, 7, 20, 28 and 29 Jul and 3, 4 and 11 Aug. The BeetCast leafspot advisory in the Frankenmuth area from 1 May to 20 Sep accumulated 236 daily severity values compared to 224 accumulated during the same period in 2015. 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. At the 6 Sep 16 rating, means of the resistant and susceptible internal controls for the entire nursery (including three additional experiments) were 3.4 and 6.8, respectively, across the nursery. At the peak of the epiphytotic in 2015 (9 Sep),

these means were 3.2 and 7.0 for resistant and susceptible checks, respectively. Means of contributor lines in the entire nursery (including three additional tests) in 2016 ranged from 3.0 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 three rating dates, but one accession, PI 232893, was not significantly different from the resistant control at the first rating date (Table 5). At the final rating date, near the peak of the epiphytotic, 21 accessions and all three East Lansing breeding lines were significantly different from the susceptible control. Five of these (PI 232893, PI 535822, PI 535827, PI 535832 and PI 583781) and two of the EL entries (789 and 791) also were significantly different from the susceptible control at the third ratings. No entry was as resistant as the resistant check. Six PIs (PI 334063, PI 334064, PI 535822, PI 535825, PI564759, and PI 583780) and one EL entry (789) required removal of seed stalks from at least one replicate during the season. These data, and more information on the accessions evaluated, are available through the USDA-ARS GRIN database at http://www.ars-grin.gov/npgs."

We extend our gratitude to Paul Horny and Dennis Fleischmann for their essential help with nursery and farm operations, to Michigan Sugar for help with thinning and agronomic evaluations.

We also thank the Michigan State University students who assisted with all aspects of conducting the nursery: Ashley Wieczorek, Andy Funk, Paul Galewski, Doug Minier, Daniel Bublitz, and Linnea Bergman.

**Table 5**: Plant Introduction (PI) Cercospora Leaf Spot nursery results and materials derived from previous nurseries crossed with traditional East Lansing germplasm.

| | Identification | | | Average disease index[z] | | | |
|---|---|---|---|---|---|---|---|
| Entry | Donor's ID | subsp. | Origin | 18 Aug | 23 Aug | 30 Aug | 6 Sep |
| Ames19164 | Bijskaja 032 | *vulgaris* | Russian Federation | 2.7 | 3.7 | 4.7 | 6.3 |
| Ames19168 | Ramonskaja 023 | *vulgaris* | Russian Federation | 3.7 | 4.0 | 5.0 | 6.3 |
| PI 165013 | Hayvan paucari | *vulgaris* | Turkey | 3.3 | 5.0 | 6.0 | 7.0 |
| PI 198680 | No. 20 | *vulgaris* | Italy | n.d. | n.d. | n.d. | n.d. |
| PI 232893 | IDBBNR 5408 | *vulgaris* | Hungary | 1.3 | 3.0 | 3.7 | 5.0 |
| PI 344063 | IDBBNR 5466 | *vulgaris* | Turkey | 2.7 | 4.7 | 5.3[w] | 5.8[w] |
| PI 344064 | IDBBNR 5467 | *vulgaris* | Turkey | 4.0 | 4.7 | 5.3 | 6.0 |
| PI 355964 | Pervomajskij polyhybrid 10 | *vulgaris* | Former Soviet Union | 2.0 | 4.0 | 4.7 | 5.7 |
| PI 381647 | Ramonsk 100 | *vulgaris* | Former Soviet Union | 2.7 | 3.7 | 5.0 | 6.0 |
| PI 411128 | "O" type N1 | *vulgaris* | Former Soviet Union | 3.0 | 4.7 | 5.7 | 6.3 |
| PI 535822 | Senior | *vulgaris* | Poland | 2.0 | 2.7 | 3.7 | 4.0 |
| PI 535823 | Albus | *vulgaris* | Poland | 3.7 | 5.0 | 5.0 | 6.0 |
| PI 535825 | Cyclop | *vulgaris* | Poland | 2.7 | 4.0 | 5.0 | 5.7 |
| PI 535827 | Rekord Poly | *vulgaris* | Poland | 2.0 | 3.7 | 4.0 | 5.0 |
| PI 535832 | Goliat Poly | *vulgaris* | Poland | 2.0 | 3.7 | 4.0 | 4.0 |
| Pl 535836 | Aj-Polycama | *vulgaris* | Poland | 3.3 | 3.7 | 5.0 | 5.7 |
| PI 560130 | C762-17 | *vulgaris* | United States, CA | 3.7 | 5.0 | 5.7 | 6.0 |
| PI 860338 | C47R | *vulgaris* | United States, CA | 3.0 | 4.3 | 5.3 | 5.7 |
| PI 560339 | C93 | *vulgaris* | United States, CA | 2.3 | 4.0 | 4.7 | 5.7 |
| PI 560340 | C94 | *vulgaris* | United States, CA | 2.7 | 4.0 | 5.0 | 6.0 |
| PI 564758 | C790-15 | *vulgaris* | United States, CA | 2.7 | 4.0 | 5.0 | 5.3 |
| PI 564759 | C790-54 | *vulgaris* | United States, CA | 3.3 | 4.7 | 5.7 | 6.0 |
| PI 583780 | Y322 | *vulgaris* | United States, ND | 2.3 | 3.7 | 4.7 | 6.0 |
| PI 583781 | Y387 | *vulgaris* | United States, ND | 2.7 | 3.3 | 4.0 | 6.0 |
| PI 590585 | CT 7 | *vulgaris* | United States, UT | 2.7 | 4.3 | 5.3 | 6.7 |
| PI 590587 | CT 5B | *vulgaris* | United States, UT | 3.0 | 5.3 | 5.3 | 6.0 |
| PI 590588 | Klein E | *vulgaris* | United States, UT | 3.3 | 4.0 | 5.0 | 6.0 |
| PI 590613 | Elite TM | vulgaris | France | 3.0 | 4.7 | 5.3 | 6.3 |
| PI 590615 | Elite Desprez type A | *vulgaris* | France | 3.7 | 4.7 | 5.7 | 6.3 |
| PI 590648 | C569 | *vulgaris* | United States, CA | 3.3 | 4.3 | 5.0 | 6.3 |
| 791 | EL-A1402160 | *vulgaris* | 2013 PI selections | 2.0 | 3.0 | 4.3 | 5.3 |
| 790 | EL-A021503 | *vulgaris* | PI selections | 2.7 | 3.0 | 4.7 | 5.3 |
| 789 | EL-A12-00029 | *vulgaris* | 2011 PI selections | 2.7 | 3.3 | 4.3 | 4.3 |
| Leaf Spot Susceptible Check [y] | (12N0050)..USA……..…….. | | | ……4.0 | 5.0 | 5.3 | 7.0 |
| Leaf Spot Resistant Check [x] | (EL50/2)……USA……..….. | | | … 1.0 | 1.0 | 2.0 | 3.0 |
| | $LSD_{0.05}$ | | | 0.98 | 0.85 | 0.84 | 0.79 |
| Trial Mean…… | | | | ……. …….2.8 | 4.0 | 4.8 | 5.7 |

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.

[x] 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

# Michigan Sugar Company Annual Report for Trials Conducted at the Saginaw Valley Research and Education Center

Each year Michigan Sugar Company conducts variety research trials throughout the sugarbeet growing area including at the Saginaw Valley Research and Education Center. The trials are of two types: 1. Variety trials that determine the yield and quality potential of new varieties, and 2: Disease trials that evaluate varieties for tolerance to *Cercospora* leafspot and *Rhizoctonia* root rot. Michigan Sugar Company also coordinates variety research with Dr. Linda Hanson and Dr. Mitch McGrath at the SVREC. The following tables illustrate research results for 2015 and 2016.

# Official Variety Trial

## Michigan Sugar Company

## Average of 6 Locations - 2016

**Trial Quality:** Good
**Plant/Harv:** April 15/Oct 19
**Plots:** 2 rows X 38 ft, 8 reps
**Row Spacing:** 22 inches
**Seeding Rate:** 2 inches,
thinned to 200 beets/100 f
except Stoneman Ithaca = 150 beets/100 ft

**Locations:** Grekowicz
Rayl
Shaffner
Stoneman Ithaca
SVREC
Trost

**Cerc Control:** Good Control
6 to 7 Applic.
**Rhizoc Control:** Good Control
Quadris IF and 8 lf

| Variety | $/A | RWSA | RWST | | Yield | | Sugar | | CJP | | Emerge | | CLS* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lb/T | Rank | T/A | Rank | % | Rank | % | Rank | % | Rank | 0-9 | Rank |
| B-12RR2N | **$1,500** | **10072** | **244** | **2** | **41.6** | **2** | **16.5** | **2** | 95.4 | 9 | 54.7 | 12 | 1.6 | 18 |
| SX-RR1245N | **$1,462** | **9841** | 241 | 6 | **41.1** | **4** | 16.3 | 7 | 95.4 | 7 | **60.0** | **5** | 1.5 | 7 |
| B-1399 | **$1,452** | **9773** | 232 | 16 | **42.2** | **1** | 15.7 | 18 | **95.7** | **2** | **61.3** | **2** | **1.4** | **5** |
| B-18RR4N | $1,423 | 9568 | 239 | 8 | 40.1 | 7 | 16.2 | 8 | 95.2 | 12 | 52.8 | 17 | 1.6 | 14 |
| B-149N | $1,422 | 9573 | 231 | 17 | **41.4** | **3** | 15.7 | 16 | 95.1 | 15 | 54.5 | 13 | 1.6 | 19 |
| HIL-9732NT | $1,413 | 9521 | 241 | 7 | 39.6 | 10 | 16.3 | 3 | 95.2 | 14 | 55.0 | 9 | 1.5 | 10 |
| SX-RR1251 | $1,412 | 9514 | 239 | 9 | 40.1 | 8 | 16.1 | 10 | 95.5 | 6 | 49.9 | 20 | 1.5 | 6 |
| C-G333NT | $1,410 | 9482 | 234 | 13 | 40.6 | 6 | 15.9 | 14 | 95.2 | 13 | 56.4 | 7 | 1.6 | 16 |
| MA-513NT | $1,402 | 9461 | 238 | 11 | 39.7 | 9 | 16.2 | 9 | 95.1 | 16 | 53.6 | 15 | 1.5 | 8 |
| C-G351NT | $1,383 | 9295 | **247** | **1** | 37.9 | 16 | **16.6** | **1** | **95.5** | **4** | 54.8 | 11 | **1.3** | **1** |
| C-RR059 | $1,379 | 9289 | 241 | 5 | 38.6 | 14 | 16.3 | 6 | 95.5 | **5** | **60.7** | **3** | 1.5 | 11 |
| B-133N | $1,379 | 9257 | 227 | 19 | **41.0** | **5** | 15.6 | 19 | 94.7 | 19 | 55.0 | 10 | 1.6 | 13 |
| SX-RR1243 | $1,378 | 9297 | 238 | 10 | 39.1 | 12 | 16.1 | 11 | **95.6** | **3** | 53.8 | 14 | **1.4** | **4** |
| C-G515 | $1,376 | 9258 | 235 | 12 | 39.5 | 11 | 16.0 | 13 | 95.3 | 11 | 55.5 | 8 | 1.7 | 20 |
| HM-NT9617RI | $1,347 | 9063 | 234 | 14 | 38.9 | 13 | 16.0 | 12 | 94.9 | 18 | 52.7 | 18 | 1.6 | 15 |
| HM-NT9607RI | $1,326 | 8916 | 242 | 4 | 36.9 | 19 | 16.3 | 4 | 95.4 | 8 | **62.6** | **1** | **1.4** | **3** |
| SX-1212RR | $1,311 | 8864 | 234 | 15 | 37.8 | 17 | 15.9 | 15 | 95.4 | 10 | 53.1 | 16 | 1.6 | 17 |
| HM-28RR | $1,288 | 8676 | 226 | 20 | 38.4 | 15 | 15.5 | 20 | 95.0 | 17 | **60.5** | **4** | 1.6 | 12 |
| HM-173RR | $1,269 | 8557 | 228 | 18 | 37.7 | 18 | 15.7 | 17 | 94.7 | 20 | 58.7 | 6 | 1.5 | 9 |
| HM-9616RR | $1,265 | 8524 | **243** | **3** | 35.1 | 20 | 16.3 | 5 | **95.7** | **1** | 51.8 | 19 | **1.4** | **2** |
| Average | $1,379.7 | 9290.0 | 236.8 | | 39.36 | | #### | | #### | | #### | | 1.51 | |
| LSD 5% | 49.5 | 333.6 | 3.9 | | 1.3 | | 0.2 | | 0.2 | | 2.8 | | 0.09 | |
| CV % | 3.9 | 3.9 | 1.8 | | 3.5 | | 1.4 | | 0.2 | | 5.3 | | 6.57 | |

***CLS:** Cercospora rating taken from the individual variety trials not from the Cercospora Nurseries. Ratings were taken one week prior to harvesting.

**$/A:** Gross dollars per acre assuming a $35 payment and trial average RWST.

**Bold:** Results are not statistically different from top-ranking variety in each column.

**Comments:** The six OVT's used for approval in 2016 had good quality. Quadris was applied in-furrow and at the 6-8 leaf stage and Rhizoctonia control was very good. The average stand in the trials was 200 beets / 100 ft. Two locations had a moderate level of nematode pressure (Rayl and Shaffner). An average of 6 fungicide applications were applied for Cerocspora control which provided very good contro (below economic levels). The low RWST may have been due to the drought which stored nitrogen.

# Cercospora Nursery
## Michigan Sugar Company
## Average of 2 years, 2015-2016

**Trial Quality:** Good
**Locations:** 2015 - Blumfield, SVREC, Yoder (Pigeon)
2016 - Blumfield, Laker (Elkton), Gilford, SVREC
**Plot Size:** MSC - 2 rows X 17.5 ft, 5 reps
SVREC - 2 rows X 20 ft, 5 reps
**Inoculation:** Trials are inoculated

| Variety | Avg of 2 Years CLS Rate 0-9 | 2015 CLS Rate 0-9 | 2016 CLS Rate 0-9 |
|---|---|---|---|
| B-1399 | **3.5** | 3.5 | 3.6 |
| HM-28RR | **3.7** | 4.0 | 3.5 |
| HM-173RR | **3.8** | 3.9 | 3.7 |
| HM-9616RR | **3.8** | 3.9 | 3.7 |
| HM-NT9607RR | **3.8** | 4.0 | 3.6 |
| C-G351NT | **3.9** | 4.0 | 3.8 |
| SX-RR1243 | **4.0** | 3.8 | 4.1 |
| Resistant Check | **4.1** | 3.7 | 4.6 |
| SX-RR1245N | **4.1** | 3.9 | 4.4 |
| C-RR059 | **4.1** | 4.0 | 4.3 |
| B-12RR2N | **4.2** | 4.3 | 4.1 |
| B-18RR4N | **4.2** | 4.3 | 4.1 |
| C-G515 | 4.3 | 4.3 | 4.3 |
| SX-RR1251 | 4.3 | 4.3 | 4.3 |
| SX-1212RR | 4.4 | 4.3 | 4.4 |
| HM-NT9617RR | 4.5 | 4.3 | 4.6 |
| C-G333NT | 4.5 | 4.6 | 4.5 |
| B-133N | 4.6 | 4.6 | 4.6 |
| B-149N | 4.7 | 4.8 | 4.5 |
| HIL-9732NT | 4.8 | 4.5 | 5.2 |
| MA-513NT | 4.9 | 4.7 | 5.1 |
| Susceptible Check | 5.5 | 6.4 | 4.6 |
| Average | 4.26 | 4.27 | 4.25 |

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

**Comments:** Trial began being rated when Cercospora levels reach economic impact levels (ratings of 3). Trials are rated 5-7 times until most susceptible varieties reach a rating of 9. All ratings are averaged together to obtain ratings in chart above. All varieties will eventually burn down if not sprayed with fungicide.

# Rhizoctonia Nursery
## Michigan Sugar Company
## Average of 2 years, 2015-2016

**Trial Quality:** Good
**Location:** 2015 and 2016, Richville, MI
**Plot Size:** 2 rows X 25 ft, 6 reps
**Inoculation:** Inoculated with Rhizoctonia Solani AG 2-2 IIIB

| Variety | Root Rating 0-7 | Estimated Root Rot % |
|---|---|---|
| HM-9616RR | **3.0** | 5.0 |
| B-133N | **3.0** | 10.0 |
| HM-NT9617RR | 3.8 | 21.4 |
| Resistant Check | 3.8 | 21.8 |
| C-G333NT | 3.9 | 23.0 |
| B-1399 | 4.0 | 25.0 |
| HM-173RR | 4.0 | 25.0 |
| C-RR059 | 4.2 | 28.8 |
| HM-28RR | 4.2 | 29.8 |
| C-G515 | 4.3 | 31.8 |
| B-149N | 4.3 | 32.3 |
| C-G351NT | 4.4 | 34.3 |
| SX-RR1243 | 4.4 | 34.5 |
| HM-NT9607RR | 4.4 | 34.8 |
| MA-513NT | 4.6 | 40.8 |
| SX-RR1251 | 4.7 | 41.5 |
| SX-RR1245N | 4.8 | 44.5 |
| HIL-9732N | 4.8 | 45.3 |
| B-12RR2N | 4.8 | 45.5 |
| SX-1212RR | 4.8 | 45.8 |
| B-18RR4N | 4.8 | 46.0 |
| Susceptible Check | 5.0 | 50.5 |
| Average | 4.3 | 32.6 |
| LSD 5% | 0.8 | |
| CV % | 8.5 | |

**Bold:** Results are not significantly different from the top ranking variety in each column
*Rating System:

0 = No Infection
1 = less than 2% infection
2 = less than 5% rotted roots
3 = 5 to 25% rotted roots
4 = 26 to 50% rotted roots
5 = 51 to 75% rotted roots
6 = 76 to 95% rotted roots
7 = 100% rotted roots

During evaluations, roots were dug and assigned values from 0 to 7. Each plot contained approximately 50 roots and each root was rated.

**Ethotron tankmixtures with Stinger in sugarbeet**

Trial ID: SB01-16 Study Dir.: Sprague, Powell, Stiles
Conducted: SVREC Investigator: Christy Sprague

**Planting Date:** Apr-16-2016
**Variety:** Hilleshog 9616RR
**Population:** 4.37 spacing
**Soil Type:** SCL sandy clay loam
**Plot Size:** 10 X 30 FT
**Row Spacing:** 30 IN
**No. of Reps:** 4
**% OM:** 2.5
**pH:** 7.8
**Study Design:** Randomized Complete Block (RCB)

**Tillage/Previous Crops:** Previous crop: wheat Fall moldboard plow; spring soil finished with fertlizer; planted stale seedbed
**Fertilizer:** 217 lb/A Urea-broadcast and incorporated (100 lb of actual N/A)

**Crop and Weed Description**

| Weed | Code | Common Name | Scientific Name |
|---|---|---|---|
| 1 | CHEAL | lambsquarters, common | Chenopodium album |
| 2 | AMBEL | ragweed, common | Ambrosia artemisiifolia |

| Crop | Code | Common Name |
|---|---|---|
| 1 | BEAVA | Sugarbeet |

**Application Description**

| | A |
|---|---|
| **Application Timing:** | POST |
| **Date Treated:** | May-26-2016 |
| **Time Treated:** | 11:30 AM |
| **% Cloud Cover:** | 70 |
| **Air Temp., Unit:** | 81 F |
| **% Relative Humidity:** | 60 |
| **Wind Speed/Unit/Dir:** | 9 mph SSW |
| **Soil Temp, Unit:** | 74 F |
| **Leaf Moist/Dew Presence (Y/N):** | 5 |
| **Soil Moist:** | 3 |

**Crop Stage at Each Application**

| | A |
|---|---|
| **Crop 1 Name:** | BEAVA |
| **Height:** | 1- " (2) |
| **Stage:** | 6L |

**Weed Stage at Each Application**

| | A |
|---|---|
| **Weed 1 Name:** | CHEAL |
| **Height:** | .5-4 " (2) |
| **Stage:** | 4-8L |
| **Weed 2 Name:** | AMBEL |
| **Height:** | 1-3 " (2) |
| **Stage:** | 4-8L |

**Weed Density**

| | 1 | 2 |
|---|---|---|
| **Date:** | May-26-2016 | May-26-2016 |
| **Weed Name:** | CHEAL | AMBEL |
| **Density:** | 8 FT2 | 4 FT2 |

**Application Equipment**

| Appl | Sprayer Type | Ground Speed | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | Spray Volume | Carrier | Operation Pressure |
|---|---|---|---|---|---|---|---|---|---|---|
| A | CUB | 3.8 mph | AIXR | 11003 | 22 " | 20 " | 100 " | 19 GAL/AC | WATER | 30 PSI |

**Comments:**

**Ethotron tankmixtures with Stinger in sugarbeet**

**Trial ID: SB01-16 Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Sprague, Powell, Stiles**

| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pest Code | | | | | | CHEAL | | CHEAL | AMBEL | | CHEAL |
| Crop Code | | | | | BEAVU | | BEAVU | | | BEAVU | |
| Rating Date | | | | | Jun-3-2016 | Jun-3-2016 | Jun-9-2016 | Jun-9-2016 | Jun-9-2016 | Jun-22-2016 | Jun-22-2016 |
| Rating Type | | | | | injury | control | injury | control | control | injury | control |
| Rating Unit | | | | | percent | percent | percent | percent | percent | percent | percent |
| Trt-Eval Interval | | | | | 8 DA-A | 8 DA-A | 14 DA-A | 14 DA-A | 14 DA-A | 27 DA-A | 27 DA-A |
| Number of Decimals | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | Roundup PowerMax | 22 | fl oz/a | A | 0 | 85 | 0 | 90 | 90 | 0 | 74 |
| 1 | AMS | 17 | lb/100 gal | A | | | | | | | |
| 2 | Stinger | 0.5 | pt/a | A | 15 | 0 | 5 | 0 | 90 | 0 | 24 |
| 3 | Stinger | 0.5 | pt/a | A | 30 | 78 | 20 | 86 | 90 | 0 | 80 |
| 3 | Roundup PowerMax | 22 | fl oz/a | A | | | | | | | |
| 3 | AMS | 17 | lb/100 gal | A | | | | | | | |
| 4 | Ethotron | 0.75 | pt/a | A | 0 | 83 | 0 | 93 | 84 | 0 | 77 |
| 4 | Roundup PowerMax | 22 | fl oz/a | A | | | | | | | |
| 4 | AMS | 17 | lb/100 gal | A | | | | | | | |
| 5 | Ethotron | 0.75 | pt/a | A | 30 | 83 | 25 | 93 | 88 | 0 | 82 |
| 5 | Stinger | 0.5 | pt/a | A | | | | | | | |
| 5 | Roundup PowerMax | 22 | fl oz/a | A | | | | | | | |
| 5 | AMS | 17 | lb/100 gal | A | | | | | | | |
| 6 | Untreated | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | Ethotron | 0.75 | pt/a | A | 0 | 0 | 0 | 0 | 0 | 0 | 43 |
| 8 | Ethotron | 0.75 | pt/a | A | 30 | 95 | 22 | 100 | 90 | 0 | 88 |
| 8 | Stinger | 0.5 | pt/a | A | | | | | | | |
| 8 | Dual Magnum | 1.33 | pt/a | A | | | | | | | |
| 8 | Roundup PowerMax | 22 | fl oz/a | A | | | | | | | |
| 8 | AMS | 17 | lb/100 gal | A | | | | | | | |
| LSD P=.05 | | | | | . | 5.6 | 7.3 | 5.1 | 6.6 | . | 6.8 |
| Standard Deviation | | | | | 0.0 | 3.8 | 5.0 | 3.5 | 4.4 | 0.0 | 4.6 |
| CV | | | | | 0.0 | 7.24 | 55.48 | 6.03 | 6.69 | 0.0 | 7.83 |

Missing data estimates are included in columns:Average=1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18
Could not calculate LSD (% mean diff) for columns 1,6,8,11 because error mean square = 0.

**Ethotron tankmixtures with Stinger in sugarbeet**

**Trial ID: SB01-16 Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Sprague, Powell, Stiles**

| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pest Code | | | | | | CHEAL | AMBEL | | CHEAL | AMBEL | |
| Crop Code | | | | | BEAVU | | | BEAVU | | | |
| Rating Date | | | | | Jun-30-2016 | Jun-30-2016 | Jun-30-2016 | Jul-18-2016 | Jul-18-2016 | Jul-18-2016 | |
| Rating Type | | | | | injury | control | control | injury | control | control | |
| Rating Unit | | | | | percent | percent | percent | percent | percent | percent | |
| Trt-Eval Interval | | | | | 35 DA-A | 35 DA-A | 35 DA-A | 53 DA-A | 53 DA-A | 53 DA-A | |
| Number of Decimals | | | | | 0 | 0 | 0 | 0 | 0 | 0 | |
| 1 | Roundup PowerMax | 22 | fl oz/a | A | 0 | 80 | 99 | 0 | 90 | 82 | |
| 1 | AMS | 17 | lb/100 gal | A | | | | | | | |
| 2 | Stinger | 0.5 | pt/a | A | 0 | 30 | 100 | 0 | 18 | 87 | |
| 3 | Stinger | 0.5 | pt/a | A | 0 | 79 | 100 | 0 | 96 | 90 | |
| 3 | Roundup PowerMax | 22 | fl oz/a | A | | | | | | | |
| 3 | AMS | 17 | lb/100 gal | A | | | | | | | |
| 4 | Ethotron | 0.75 | pt/a | A | 0 | 87 | 97 | 0 | 99 | 82 | |
| 4 | Roundup PowerMax | 22 | fl oz/a | A | | | | | | | |
| 4 | AMS | 17 | lb/100 gal | A | | | | | | | |
| 5 | Ethotron | 0.75 | pt/a | A | 0 | 85 | 100 | 0 | 99 | 90 | |
| 5 | Stinger | 0.5 | pt/a | A | | | | | | | |
| 5 | Roundup PowerMax | 22 | fl oz/a | A | | | | | | | |
| 5 | AMS | 17 | lb/100 gal | A | | | | | | | |
| 6 | Untreated | | | | 0 | 0 | 0 | 0 | 0 | 0 | |
| 7 | Ethotron | 0.75 | pt/a | A | 0 | 39 | 20 | 0 | 50 | 47 | |
| 8 | Ethotron | 0.75 | pt/a | A | 0 | 90 | 100 | 0 | 100 | 90 | |
| 8 | Stinger | 0.5 | pt/a | A | | | | | | | |
| 8 | Dual Magnum | 1.33 | pt/a | A | | | | | | | |
| 8 | Roundup PowerMax | 22 | fl oz/a | A | | | | | | | |
| 8 | AMS | 17 | lb/100 gal | A | | | | | | | |
| LSD P=.05 | | | | | . | 8.0 | 1.5 | . | 5.4 | 6.7 | |
| Standard Deviation | | | | | 0.0 | 5.4 | 1.0 | 0.0 | 3.7 | 4.5 | |
| CV | | | | | 0.0 | 8.79 | 1.32 | 0.0 | 5.31 | 6.37 | |

**Ethotron tankmixtures with Stinger in sugarbeet**

**Trial ID: SB01-16 Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Sprague, Powell, Stiles**

| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pest Code | | | | | | | | | |
| Crop Code | | | | | BEAVU | BEAVU | BEAVU | BEAVU | BEAVU |
| Rating Date | | | | | Sep-20-2016 | Sep-20-2016 | Sep-20-2016 | Sep-20-2016 | Sep-20-2016 |
| Rating Type | | | | | stand count | % sugar | yield | RWST | RWSA |
| Rating Unit | | | | | 100' row | | ton/acre | #/ton | #/acre |
| Trt-Eval Interval | | | | | 117 DA-A | 117 DA-A | 117 DA-A | 117 DA-A | 117 DA-A |
| Number of Decimals | | | | | 0 | 1 | 1 | 0 | 0 |
| 1 | Roundup PowerMax | 22 | fl oz/a | A | 240 | 16.4 | 27.2 | 247 | 6700 |
| 1 | AMS | 17 | lb/100 gal | A | | | | | |
| 2 | Stinger | 0.5 | pt/a | A | 240 | 17.3 | 8.7 | 265 | 2262 |
| 3 | Stinger | 0.5 | pt/a | A | 270 | 15.6 | 27.9 | 234 | 6502 |
| 3 | Roundup PowerMax | 22 | fl oz/a | A | | | | | |
| 3 | AMS | 17 | lb/100 gal | A | | | | | |
| 4 | Ethotron | 0.75 | pt/a | A | 262 | 16.0 | 28.0 | 242 | 6793 |
| 4 | Roundup PowerMax | 22 | fl oz/a | A | | | | | |
| 4 | AMS | 17 | lb/100 gal | A | | | | | |
| 5 | Ethotron | 0.75 | pt/a | A | 241 | 15.8 | 22.3 | 238 | 5272 |
| 5 | Stinger | 0.5 | pt/a | A | | | | | |
| 5 | Roundup PowerMax | 22 | fl oz/a | A | | | | | |
| 5 | AMS | 17 | lb/100 gal | A | | | | | |
| 6 | Untreated | | | | 207 | 17.4 | 2.0 | 264 | 527 |
| 7 | Ethotron | 0.75 | pt/a | A | 251 | 16.3 | 12.7 | 247 | 3144 |
| 8 | Ethotron | 0.75 | pt/a | A | 249 | 15.9 | 29.5 | 237 | 6950 |
| 8 | Stinger | 0.5 | pt/a | A | | | | | |
| 8 | Dual Magnum | 1.33 | pt/a | A | | | | | |
| 8 | Roundup PowerMax | 22 | fl oz/a | A | | | | | |
| 8 | AMS | 17 | lb/100 gal | A | | | | | |
| LSD P=.05 | | | | | 28.2 | 1.24 | 4.57 | 21.0 | 920.8 |
| Standard Deviation | | | | | 19.2 | 0.84 | 3.08 | 14.1 | 619.8 |
| CV | | | | | 7.82 | 5.12 | 15.55 | 5.72 | 13.0 |

**Evaluation of new formulations of Sequence for use in sugarbeet**

Trial ID: SB02-16 Study Dir.: Sprague, Powell, Stiles
Conducted: SVREC Investigator: Christy Sprague

| | | | |
|---|---|---|---|
| **Planting Date:** | Apr-16-2016 | **Row Spacing:** | 30 IN |
| **Variety:** | Hilleshog 9616RR | **No. of Reps:** | 4 |
| **Population:** | 4.37 spacing | **% OM:** | 2.5 |
| **Soil Type:** | SCL sandy clay loam | **pH:** | 7.8 |
| **Plot Size:** | 10 X 30 FT | **Study Design:** | Randomized Complete Block (RCB) |

**Tillage/Previous Crops:** Fall moldboard plow; spring soil finished with fertlizer; planted stale seedbed
**Fertilizer:** 217 lb/A Urea-broadcast and incorporated (100 lb of actual N/A)

**Crop and Weed Description**

| Weed | Code | Common Name | Scientific Name |
|---|---|---|---|
| 1 | CHEAL | lambsquarters, common | Chenopodium album |
| 2 | AMBEL | ragweed, common | Ambrosia artemisiifolia |
| **Crop** | **Code** | **Common Name** | |
| 1 | BEAVA | Sugarbeet | |

**Application Description**

| | A |
|---|---|
| **Application Timing:** | POST |
| **Date Treated:** | Jun-2-2016 |
| **Time Treated:** | 11:30 AM |
| **% Cloud Cover:** | 5 |
| **Air Temp., Unit:** | 75 F |
| **% Relative Humidity:** | 40 |
| **Wind Speed/Unit/Dir:** | 8 mph W |
| **Soil Temp, Unit:** | 71 F |
| **Leaf Moist/Dew Presence (Y/N):** | 0 |
| **Soil Moist:** | 5 |

**Crop Stage at Each Application**

| | A |
|---|---|
| **Crop 1 Name:** | BEAVA |
| **Height:** | 5 " |
| **Stage:** | 8-10L |

**Weed Stage at Each Application**

| | A |
|---|---|
| **Weed 1 Name:** | CHEAL |
| **Height:** | 2-6 " (5) |
| **Stage:** | 8-12L |
| **Weed 2 Name:** | AMBEL |
| **Height:** | 2-6 " (5) |
| **Stage:** | 6-8L |

**Weed Density**

| | 1 | 2 |
|---|---|---|
| **Date:** | Jun-2-2016 | Jun-2-2016 |
| **Weed Name:** | CHEAL | AMBEL |
| **Density:** | 8 FT2 | 4 FT2 |

**Application Equipment**

| Appl | Sprayer Type | Ground Speed | Nozzle Type | Nozzle Size | Nozzle Height | Nozzle Spacing | Boom Width | Spray Volume | Carrier | Operation Pressure |
|---|---|---|---|---|---|---|---|---|---|---|
| **A** | CUB | 3.8 mph | AIXR | 11003 | 22 " | 20 " | 100 " | 19 GAL/AC | WATER | 30 PSI |

**Comments:**

**Evaluation of new formulations of Sequence for use in sugarbeet**

**Trial ID: SB02-16 Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Sprague, Powell, Stiles**

| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pest Code | | | | | | | | CHEAL | AMAPO | AMBEL | | |
| Crop Code | | | | | BETVU | BETVU | BETVU | | | | | BETVU |
| Rating Date | | | | | Jun-5-2016 | Jun-9-2016 | Jun-16-2016 | Jun-16-2016 | Jun-16-2016 | Jun-16-2016 | | Jun-30-2016 |
| Rating Type | | | | | injury | injury | injury | control | control | control | | injury |
| Rating Unit | | | | | percent | percent | percent | percent | percent | percent | | percent |
| Trt-Eval Interval | | | | | 3 DA-A | 7 DA-A | 14 DA-A | 14 DA-A | 14 DA-A | 14 DA-A | | 28 DA-A |
| Number of Decimals | | | | | 0 | 0 | 0 | 0 | 0 | 0 | | 0 |
| 1 | Sequence | 3 | pt/a | A | 0 | 0 | 0 | 66 | 100 | 98 | | 0 |
| 1 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 2 | Sequence | 6 | pt/a | A | 2 | 2 | 0 | 77 | 100 | 100 | | 0 |
| 2 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 3 | 'AN' A20009' | 3.7 | pt/a | A | 2 | 1 | 0 | 51 | 100 | 96 | | 0 |
| 3 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 4 | 'AN' A20009' | 7.4 | pt/a | A | 4 | 2 | 0 | 64 | 100 | 99 | | 0 |
| 4 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 5 | Roundup PowerMax | 25 | fl oz/a | A | 1 | 0 | 0 | 94 | 100 | 98 | | 0 |
| 5 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 6 | Untreated | | | | 0 | 0 | 0 | 0 | 0 | 0 | | 0 |
| 7 | 'AX' A20009' | 3.7 | pt/a | A | 2 | 1 | 0 | 60 | 100 | 97 | | 0 |
| 7 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 8 | 'AX' A20009' | 7.4 | pt/a | A | 4 | 1 | 0 | 64 | 100 | 99 | | 0 |
| 8 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 9 | 'AY' A20009' | 3.7 | pt/a | A | 2 | 1 | 0 | 55 | 100 | 95 | | 0 |
| 9 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 10 | 'AY' A20009' | 7.4 | pt/a | A | 5 | 4 | 0 | 65 | 100 | 100 | | 0 |
| 10 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 11 | 'BA' A20009' | 3.7 | pt/a | A | 3 | 1 | 0 | 55 | 100 | 100 | | 0 |
| 11 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 12 | 'BA' A20009' | 7.4 | pt/a | A | 4 | 1 | 0 | 65 | 100 | 100 | | 0 |
| 12 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 13 | 'BB' A20009' | 3.7 | pt/a | A | 2 | 2 | 0 | 60 | 100 | 99 | | 0 |
| 13 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 14 | 'BB' A20009' | 7.4 | pt/a | A | 2 | 2 | 0 | 66 | 100 | 100 | | 0 |
| 14 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |
| 15 | Dual Magnum | 1.18 | pt/a | A | 9 | 7 | 0 | 99 | 100 | 98 | | 0 |
| 15 | Roundup PowerMax | 25 | fl oz/a | A | | | | | | | | |
| 15 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | | |

Could not calculate LSD (% mean diff) for columns 3,5,7,9 because error mean square = 0.

**Evaluation of new formulations of Sequence for use in sugarbeet**

**Trial ID: SB02-16** **Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Sprague, Powell, Stiles**

| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pest Code | | | | | | | | CHEAL | AMAPO | AMBEL | |
| Crop Code | | | | | BETVU | BETVU | BETVU | | | | BETVU |
| Rating Date | | | | | Jun-5-2016 | Jun-9-2016 | Jun-16-2016 | Jun-16-2016 | Jun-16-2016 | Jun-16-2016 | Jun-30-2016 |
| Rating Type | | | | | injury | injury | injury | control | control | control | injury |
| Rating Unit | | | | | percent | percent | percent | percent | percent | percent | percent |
| Trt-Eval Interval | | | | | 3 DA-A | 7 DA-A | 14 DA-A | 14 DA-A | 14 DA-A | 14 DA-A | 28 DA-A |
| Number of Decimals | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | Outlook | 18 | fl oz/a | A | 2 | 0 | 0 | 97 | 100 | 95 | 0 |
| 16 | Roundup PowerMax | 25 | fl oz/a | A | | | | | | | |
| 16 | AMS (Liquid) | 2.5 | % v/v | A | | | | | | | |
| LSD P=.05 | | | | | 2.2 | 2.4 | . | 11.8 | . | 4.2 | . |
| Standard Deviation | | | | | 1.5 | 1.7 | 0.0 | 8.3 | 0.0 | 3.0 | 0.0 |
| CV | | | | | 57.97 | 113.8 | 0.0 | 12.8 | 0.0 | 3.23 | 0.0 |

**Evaluation of new formulations of Sequence for use in sugarbeet**

**Trial ID: SB02-16** **Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Sprague, Powell, Stiles**

| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | CHEAL | AMAPO | AMBEL | POLCO |
|---|---|---|---|---|---|---|---|---|
| | Pest Code | | | | | | | |
| | Crop Code | | | | | | | |
| | Rating Date | | | | Jun-30-2016 | Jun-30-2016 | Jun-30-2016 | Jun-30-2016 |
| | Rating Type | | | | control | control | control | control |
| | Rating Unit | | | | percent | percent | percent | percent |
| | Trt-Eval Interval | | | | 28 DA-A | 28 DA-A | 28 DA-A | 28 DA-A |
| | Number of Decimals | | | | 0 | 0 | 0 | 0 |
| 1 | Sequence | 3 | pt/a | A | 70 | 100 | 100 | 78 |
| 1 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 2 | Sequence | 6 | pt/a | A | 82 | 100 | 100 | 91 |
| 2 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 3 | 'AN' A20009' | 3.7 | pt/a | A | 49 | 100 | 100 | 81 |
| 3 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 4 | 'AN' A20009' | 7.4 | pt/a | A | 73 | 100 | 100 | 96 |
| 4 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 5 | Roundup PowerMax | 25 | fl oz/a | A | 96 | 100 | 99 | 94 |
| 5 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 6 | Untreated | | | | 0 | 0 | 0 | 0 |
| 7 | 'AX' A20009' | 3.7 | pt/a | A | 53 | 100 | 100 | 79 |
| 7 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 8 | 'AX' A20009' | 7.4 | pt/a | A | 65 | 100 | 100 | 100 |
| 8 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 9 | 'AY' A20009' | 3.7 | pt/a | A | 40 | 100 | 100 | 83 |
| 9 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 10 | 'AY' A20009' | 7.4 | pt/a | A | 61 | 100 | 100 | 98 |
| 10 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 11 | 'BA' A20009' | 3.7 | pt/a | A | 49 | 100 | 100 | 81 |
| 11 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 12 | 'BA' A20009' | 7.4 | pt/a | A | 68 | 100 | 100 | 96 |
| 12 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 13 | 'BB' A20009' | 3.7 | pt/a | A | 44 | 100 | 100 | 80 |
| 13 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 14 | 'BB' A20009' | 7.4 | pt/a | A | 59 | 100 | 100 | 95 |
| 14 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| 15 | Dual Magnum | 1.18 | pt/a | A | 100 | 100 | 100 | 99 |
| 15 | Roundup PowerMax | 25 | fl oz/a | A | | | | |
| 15 | AMS (Liquid) | 2.5 | % v/v | A | | | | |

**Evaluation of new formulations of Sequence for use in sugarbeet**

**Trial ID: SB02-16 Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Sprague, Powell, Stiles**

| Pest Code | | | | CHEAL | AMAPO | AMBEL | POLCO |
|---|---|---|---|---|---|---|---|
| Crop Code | | | | | | | |
| Rating Date | | | | Jun-30-2016 | Jun-30-2016 | Jun-30-2016 | Jun-30-2016 |
| Rating Type | | | | control | control | control | control |
| Rating Unit | | | | percent | percent | percent | percent |
| Trt-Eval Interval | | | | 28 DA-A | 28 DA-A | 28 DA-A | 28 DA-A |
| Number of Decimals | | | | 0 | 0 | 0 | 0 |
| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | | | | |
| 16 | Outlook | 18 | fl oz/a | A | 100 | 100 | 100 | 98 |
| 16 | Roundup PowerMax | 25 | fl oz/a | A | | | | |
| 16 | AMS (Liquid) | 2.5 | % v/v | A | | | | |
| LSD P=.05 | | | | | 10.6 | . | 0.5 | 10.4 |
| Standard Deviation | | | | | 7.4 | 0.0 | 0.4 | 7.3 |
| CV | | | | | 11.83 | 0.0 | 0.4 | 8.64 |

**Tank-contamination effects from dicamba on sugarbeet**

Trial ID: SB03-16 Study Dir.: Probst, Sprague
Conducted: SVREC Investigator: Christy Sprague

**Planting Date:** Apr-16-2016
**Variety:** Hilleshog 9616RR
**Population:** 4.37 "
**Soil Type:** SCL sandy clay loam
**Plot Size:** 10 X 40 FT

**Row Spacing:** 30 IN
**No. of Reps:** 4
**% OM:** 2.5
**pH:** 7.8
**Study Design:** Randomized Complete Block (RCB)

**Tillage/Previous Crops:** Fall moldboard Spring soil finish with fertlizer Stale seed bed
**Fertilizer:** 100lb N/A as Urea (217 lb/A)

**Crop and Weed Description**

| Weed | Code | Common Name | Scientific Name |
|---|---|---|---|
| 1 | | | |

| Crop | Code | Common Name |
|---|---|---|
| 1 | BETVU | |

**Application Description**

| | A | B | C |
|---|---|---|---|
| **Application Timing:** | E.POST | POST | L.POST |
| **Date Treated:** | May-20-2016 | Jun-2-2016 | Jun-22-2016 |
| **Time Treated:** | 9:00 AM | 11:00 AM | 11:30 AM |
| **% Cloud Cover:** | 20 | 30 | 30 |
| **Air Temp., Unit:** | 58 F | 74 F | 84 F |
| **% Relative Humidity:** | 58 | 74 | 65 |
| **Wind Speed/Unit/Dir:** | 6 mph SE | 8 mph | 3 mph W |
| **Soil Temp, Unit:** | 57 F | 72 F | 79 F |
| **Leaf Moist/Dew Presence (Y/N):** | 5 | 5 | 5 |
| **Soil Moist:** | 3 | 4 | 4 |

**Crop Stage at Each Application**

| | A | B | C |
|---|---|---|---|
| **Crop 1 Name:** | BETVU | BETVU | BETVU |
| **Height:** | 1 " | 4- " (6) | 10- " (12) |
| **Stage:** | 2L | 8L | Many |

**Weed Stage at Each Application**

| | A | B | C |
|---|---|---|---|
| **Weed 1 Name:** | | | |
| **Height:** | | | |
| **Stage:** | | | |

**Application Equipment**

| Appl Boom Carrier | Sprayer Spray Type | Speed Pressure | Ground Operation Type | Size | Nozzle Height | | Nozzle Spacing | | Nozzle Width | Nozzle Volume | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** | BACKPK | | 3.8 MPH | | AIXR | 11003 | 20 IN | 20 IN | 100 IN | 19 GAL/AC | V |
| **B** | BACKPK | | 3.8 MPH | | AIXR | 11003 | 20 IN | 20 IN | 100 IN | 19 GAL/AC | V |
| **C** | BACKPK | | 3.8 MPH | | AIXR | 11003 | 24 IN | 20 IN | 100 IN | 19 GAL/AC | V |

**Comments:**

**Tank-contamination effects from dicamba on sugarbeet**

**Trial ID: SB03-16 Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Probst, Sprague**

| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | BETVU injury percent 7 DAT | BETVU injury percent 14 DAT | BETVU injury percent 21 DAT | BETVU yield ton/acre | BETVU stand count 100' row | BETVU RWSA # / acre |
|---|---|---|---|---|---|---|---|---|---|---|
| Crop Code | | | | | BETVU | BETVU | BETVU | BETVU | BETVU | BETVU |
| Rating Date | | | | | | | | | | |
| Rating Type | | | | | injury | injury | injury | yield | stand count | RWSA |
| Rating Unit | | | | | percent | percent | percent | ton/acre | 100' row | # / acre |
| Trt-Eval Interval | | | | | 7 DAT | 14 DAT | 21 DAT | | | |
| Number of Decimals | | | | | 0 | 0 | 0 | 1 | 0 | 0 |
| 1 | Roundup PowerMax | 32 | fl oz/a | A | 1 | 0 | 0 | 30.8 | 262 | 7393 |
| 1 | AMS | 17 | lb/100 gal | A | | | | | | |
| 2 | Clarity (1/1600X rate) | 0.02 | fl oz/a | A | 1 | 3 | 1 | 29.2 | 262 | 7046 |
| 2 | Roundup PowerMax | 32 | fl oz/a | A | | | | | | |
| 2 | AMS | 17 | lb/100 gal | A | | | | | | |
| 3 | Clarity (1/800X rate) | 0.04 | fl oz/a | A | 2 | 5 | 3 | 30.1 | 255 | 7303 |
| 3 | Roundup PowerMax | 32 | fl oz/a | A | | | | | | |
| 3 | AMS | 17 | lb/100 gal | A | | | | | | |
| 4 | Clarity (1/400X rate) | 0.08 | fl oz/a | A | 2 | 7 | 4 | 29.1 | 259 | 6630 |
| 4 | Roundup PowerMax | 32 | fl oz/a | A | | | | | | |
| 4 | AMS | 17 | lb/100 gal | A | | | | | | |
| 5 | Clarity (1/200X rate) | 0.16 | fl oz/a | A | 3 | 14 | 6 | 28.1 | 255 | 6533 |
| 5 | Roundup PowerMax | 32 | fl oz/a | A | | | | | | |
| 5 | AMS | 17 | lb/100 gal | A | | | | | | |
| 6 | Clarity (1/100X rate) | 0.32 | fl oz/a | A | 4 | 16 | 7 | 32.0 | 258 | 7645 |
| 6 | Roundup PowerMax | 32 | fl oz/a | A | | | | | | |
| 6 | AMS | 17 | lb/100 gal | A | | | | | | |
| 7 | Roundup PowerMax | 32 | fl oz/a | B | 1 | 1 | 0 | 29.8 | 259 | 7209 |
| 7 | AMS | 17 | lb/100 gal | B | | | | | | |
| 8 | Clarity (1/800X rate) | 0.04 | fl oz/a | B | 2 | 1 | 1 | 30.6 | 266 | 7474 |
| 8 | Roundup PowerMax | 32 | fl oz/a | B | | | | | | |
| 8 | AMS | 17 | lb/100 gal | B | | | | | | |
| 9 | Clarity (1/400X rate) | 0.08 | fl oz/a | B | 3 | 7 | 2 | 30.3 | 253 | 7241 |
| 9 | Roundup PowerMax | 32 | fl oz/a | B | | | | | | |
| 9 | AMS | 17 | lb/100 gal | B | | | | | | |
| 10 | Clarity (1/200X rate) | 0.16 | fl oz/a | B | 4 | 7 | 8 | 31.1 | 257 | 7414 |
| 10 | Roundup PowerMax | 32 | fl oz/a | B | | | | | | |
| 10 | AMS | 17 | lb/100 gal | B | | | | | | |
| 11 | Clarity (1/100X rate) | 0.32 | fl oz/a | B | 5 | 19 | 18 | 28.3 | 273 | 6418 |
| 11 | Roundup PowerMax | 32 | fl oz/a | B | | | | | | |
| 11 | AMS | 17 | lb/100 gal | B | | | | | | |
| 12 | Clarity (1/50X rate) | 0.64 | fl oz/a | B | 6 | 32 | 34 | 22.6 | 267 | 5395 |
| 12 | Roundup PowerMax | 32 | fl oz/a | B | | | | | | |
| 12 | AMS | 17 | lb/100 gal | B | | | | | | |

Means followed by same letter or symbol do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.
Missing data estimates are included in columns:Average=4,6

**Tank-contamination effects from dicamba on sugarbeet**

**Trial ID: SB03-16 Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Probst, Sprague**

| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Crop Code | | | | | BETVU | BETVU | BETVU | BETVU | BETVU | BETVU |
| Rating Date | | | | | | | | | | |
| Rating Type | | | | | injury | injury | injury | yield | stand count | RWSA |
| Rating Unit | | | | | percent | percent | percent | ton/acre | 100' row | # / acre |
| Trt-Eval Interval | | | | | 7 DAT | 14 DAT | 21 DAT | | | |
| Number of Decimals | | | | | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 | Roundup PowerMax | 32 | fl oz/a | C | 1 | 0 | 0 | 30.6 | 266 | 7124 |
| 13 | AMS | 17 | lb/100 gal | C | | | | | | |
| 14 | Clarity (1/800X rate) | 0.04 | fl oz/a | C | 2 | 3 | 2 | 27.4 | 276 | 6577 |
| 14 | Roundup PowerMax | 32 | fl oz/a | C | | | | | | |
| 14 | AMS | 17 | lb/100 gal | C | | | | | | |
| 15 | Clarity (1/400X rate) | 0.08 | fl oz/a | C | 3 | 5 | 3 | 29.0 | 258 | 6962 |
| 15 | Roundup PowerMax | 32 | fl oz/a | C | | | | | | |
| 15 | AMS | 17 | lb/100 gal | C | | | | | | |
| 16 | Clarity (1/200X rate) | 0.16 | fl oz/a | C | 3 | 9 | 5 | 27.7 | 270 | 6640 |
| 16 | Roundup PowerMax | 32 | fl oz/a | C | | | | | | |
| 16 | AMS | 17 | lb/100 gal | C | | | | | | |
| 17 | Clarity (1/100X rate) | 0.32 | fl oz/a | C | 4 | 15 | 13 | 24.3 | 264 | 5893 |
| 17 | Roundup PowerMax | 32 | fl oz/a | C | | | | | | |
| 17 | AMS | 17 | lb/100 gal | C | | | | | | |
| 18 | Clarity (1/50X rate) | 0.64 | fl oz/a | C | 6 | 34 | 34 | 25.1 | 256 | 5599 |
| 18 | Roundup PowerMax | 32 | fl oz/a | C | | | | | | |
| 18 | AMS | 17 | lb/100 gal | C | | | | | | |
| LSD P=.05 | | | | | 0.6 | 3.8 | 3.1 | 4.12 | 23.0 | 1152.6 |
| Standard Deviation | | | | | 0.4 | 2.7 | 2.2 | 2.90 | 16.2 | 811.5 |
| CV | | | | | 14.95 | 28.72 | 30.17 | 10.11 | 6.19 | 11.92 |

**Tank-contamination effects from Enlist Duo on sugarbeet**

Trial ID: SB04-16 Study Dir.: Probst, Sprague
Conducted: SVREC Investigator: Christy Sprague

**Planting Date:** Apr-16-2016
**Variety:** Hilleshog 9616 RR
**Population:** 4.38 "
**Soil Type:** SCL sandy clay loam
**Plot Size:** 10 X 40 FT

**Row Spacing:** 30 IN
**No. of Reps:** 4
**% OM:** 2.5
**pH:** 7.8
**Study Design:** Randomized Complete Block (RCB)

**Tillage/Previous Crops:** Fall moldboard plow; spring soil finisher with fertilizer; Stale seedbed
**Fertilizer:** 100 lb N/A as Urea (217 lb/A)

**Crop and Weed Description**

| Weed | Code | Common Name | Scientific Name |
|---|---|---|---|
| 1 | | | |

| Crop | Code | Common Name |
|---|---|---|
| 1 | BETVU | |

**Application Description**

| | A | B | C |
|---|---|---|---|
| **Application Timing:** | E.POST | POST | L.POST |
| **Date Treated:** | May-20-2016 | Jun-2-2016 | Jun-22-2016 |
| **Time Treated:** | 9:00 AM | 11:00 AM | 12:00 PM |
| **% Cloud Cover:** | 20 | 30 | 30 |
| **Air Temp., Unit:** | 58 F | 74 F | 84 F |
| **% Relative Humidity:** | 58 | 74 | 65 |
| **Wind Speed/Unit/Dir:** | 6 mph SE | 8 mph | 3 mph W |
| **Soil Temp, Unit:** | 57 F | 72 F | 79 F |
| **Leaf Moist/Dew Presence (Y/N):** | 5 | 5 | 5 |
| **Soil Moist:** | 3 | 4 | 4 |

**Crop Stage at Each Application**

| | A | B | C |
|---|---|---|---|
| **Crop 1 Name:** | BETVU | BETVU | BETVU |
| **Height:** | 1 " | 4- " (6) | 10- " (12) |
| **Stage:** | 2L | 8L | Many |

**Weed Stage at Each Application**

| | A | B | C |
|---|---|---|---|
| **Weed 1 Name:** | | | |
| **Height:** | | | |
| **Stage:** | | | |

**Application Equipment**

| Appl Boom Carrier | Sprayer Spray Type | Speed Pressure | Ground Operation Type | Size | Nozzle Height | | Nozzle Spacing | | Nozzle Width | Nozzle Volume | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** | BACKPK | | 3.8 MPH | | AIXR | 11003 | 20 IN | 20 IN | 100 IN | 19 GAL/AC | V |
| **B** | BACKPK | | 3.8 MPH | | AIXR | 11003 | 20 IN | 20 IN | 100 IN | 19 GAL/AC | V |
| **C** | BACKPK | | 3.8 MPH | | AIXR | 11003 | 24 IN | 20 IN | 100 IN | 19 GAL/AC | V |

**Comments:**

**Tank-contamination effects from Enlist Duo on sugarbeet**

**Trial ID: SB04-16 Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Probst, Sprague**

| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | BETVU injury percent 7 DAT | BETVU injury percent 14 DAT | BETVU injury percent 21 DAT | BETVU stand count 100' row | BETVU yield ton/acre | BETVU RWSA # / acre |
|---|---|---|---|---|---|---|---|---|---|---|
| Crop Code | | | | | | | | | | |
| Rating Type | | | | | | | | | | |
| Rating Unit | | | | | | | | | | |
| Trt-Eval Interval | | | | | | | | | | |
| Number of Decimals | | | | | 0 | 0 | 0 | 0 | 1 | 0 |
| 1 | Roundup PowerMax | 32 | fl oz/a | A | 0 | 0 | 0 | 241 | 25.1 | 6219 |
| 1 | AMS | 17 | lb/100 gal | A | | | | | | |
| 2 | Enlist Duo (1/1600X rate) | 0.04688 | fl oz/a | A | 0 | 2 | 0 | 256 | 25.6 | 6184 |
| 2 | Roundup PowerMax | 32 | fl oz/a | A | | | | | | |
| 2 | AMS | 17 | lb/100 gal | A | | | | | | |
| 3 | Enlist Duo (1/800X rate) | 0.09375 | fl oz/a | A | 1 | 1 | 1 | 239 | 26.7 | 6696 |
| 3 | Roundup PowerMax | 32 | fl oz/a | A | | | | | | |
| 3 | AMS | 17 | lb/100 gal | A | | | | | | |
| 4 | Enlist Duo (1/400X rate) | 0.1875 | fl oz/a | A | 0 | 4 | 2 | 245 | 28.1 | 7179 |
| 4 | Roundup PowerMax | 32 | fl oz/a | A | | | | | | |
| 4 | AMS | 17 | lb/100 gal | A | | | | | | |
| 5 | Enlist Duo (1/200X rate) | 0.375 | fl oz/a | A | 4 | 5 | 5 | 238 | 23.3 | 5465 |
| 5 | Roundup PowerMax | 32 | fl oz/a | A | | | | | | |
| 5 | AMS | 17 | lb/100 gal | A | | | | | | |
| 6 | Enlist Duo (1/100Xrate) | 0.75 | fl oz/a | A | 5 | 7 | 5 | 243 | 26.5 | 6240 |
| 6 | Roundup PowerMax | 32 | fl oz/a | A | | | | | | |
| 6 | AMS | 17 | lb/100 gal | A | | | | | | |
| 7 | Roundup PowerMax | 32 | fl oz/a | B | 0 | 0 | 0 | 242 | 24.9 | 5843 |
| 7 | AMS | 17 | lb/100 gal | B | | | | | | |
| 8 | Enlist Duo (1/800X rate) | 0.09375 | fl oz/a | B | 3 | 3 | 1 | 241 | 27.0 | 6331 |
| 8 | Roundup PowerMax | 32 | fl oz/a | B | | | | | | |
| 8 | AMS | 17 | lb/100 gal | B | | | | | | |
| 9 | Enlist Duo (1/400X rate) | 0.1875 | fl oz/a | B | 11 | 7 | 5 | 244 | 26.3 | 6648 |
| 9 | Roundup PowerMax | 32 | fl oz/a | B | | | | | | |
| 9 | AMS | 17 | lb/100 gal | B | | | | | | |
| 10 | Enlist Duo (1/200X rate) | 0.375 | fl oz/a | B | 19 | 16 | 11 | 242 | 22.3 | 5261 |
| 10 | Roundup PowerMax | 32 | fl oz/a | B | | | | | | |
| 10 | AMS | 17 | lb/100 gal | B | | | | | | |
| 11 | Enlist Duo (1/100Xrate) | 0.75 | fl oz/a | B | 25 | 23 | 19 | 257 | 22.2 | 5381 |
| 11 | Roundup PowerMax | 32 | fl oz/a | B | | | | | | |
| 11 | AMS | 17 | lb/100 gal | B | | | | | | |
| 12 | Enlist Duo (1/50Xrate) | 1.5 | fl oz/a | B | 34 | 34 | 43 | 188 | 10.9 | 2541 |
| 12 | Roundup PowerMax | 32 | fl oz/a | B | | | | | | |
| 12 | AMS | 17 | lb/100 gal | B | | | | | | |

Means followed by same letter or symbol do not significantly differ (P=.05, LSD)
Mean comparisons performed only when AOV Treatment P(F) is significant at mean comparison OSL.
Missing data estimates are included in columns:Average=5,6

**Tank-contamination effects from Enlist Duo on sugarbeet**

**Trial ID: SB04-16 Location: SVREC**
**Investigator: Christy Sprague**
**Study Director: Probst, Sprague**

| Trt No. | Treatment Name | Rate | Rate Unit | Appl Code | BETVU injury percent 7 DAT | BETVU injury percent 14 DAT | BETVU injury percent 21 DAT | BETVU stand count 100' row | BETVU yield ton/acre | BETVU RWSA # / acre |
|---|---|---|---|---|---|---|---|---|---|---|
| Crop Code | | | | | | | | | | |
| Rating Type | | | | | | | | | | |
| Rating Unit | | | | | | | | | | |
| Trt-Eval Interval | | | | | | | | | | |
| Number of Decimals | | | | | 0 | 0 | 0 | 0 | 1 | 0 |
| 13 | Roundup PowerMax | 32 | fl oz/a | C | 0 | 0 | 0 | 235 | 21.5 | 4843 |
| 13 | AMS | 17 | lb/100 gal | C | | | | | | |
| 14 | Enlist Duo (1/800X rate) | 0.09375 | fl oz/a | C | 3 | 3 | 1 | 241 | 20.7 | 4998 |
| 14 | Roundup PowerMax | 32 | fl oz/a | C | | | | | | |
| 14 | AMS | 17 | lb/100 gal | C | | | | | | |
| 15 | Enlist Duo (1/400X rate) | 0.1875 | fl oz/a | C | 7 | 6 | 5 | 255 | 22.0 | 5134 |
| 15 | Roundup PowerMax | 32 | fl oz/a | C | | | | | | |
| 15 | AMS | 17 | lb/100 gal | C | | | | | | |
| 16 | Enlist Duo (1/200X rate) | 0.375 | fl oz/a | C | 18 | 22 | 12 | 254 | 21.1 | 5149 |
| 16 | Roundup PowerMax | 32 | fl oz/a | C | | | | | | |
| 16 | AMS | 17 | lb/100 gal | C | | | | | | |
| 17 | Enlist Duo (1/100Xrate) | 0.75 | fl oz/a | C | 24 | 29 | 21 | 258 | 18.0 | 4156 |
| 17 | Roundup PowerMax | 32 | fl oz/a | C | | | | | | |
| 17 | AMS | 17 | lb/100 gal | C | | | | | | |
| 18 | Enlist Duo (1/50Xrate) | 1.5 | fl oz/a | C | 31 | 37 | 39 | 218 | 11.5 | 2518 |
| 18 | Roundup PowerMax | 32 | fl oz/a | C | | | | | | |
| 18 | AMS | 17 | lb/100 gal | C | | | | | | |
| LSD P=.05 | | | | | 3.0 | 3.7 | 4.1 | 29.3 | 5.07 | 1346.4 |
| Standard Deviation | | | | | 2.1 | 2.6 | 2.9 | 20.6 | 3.57 | 947.0 |
| CV | | | | | 22.11 | 25.33 | 32.66 | 8.56 | 15.93 | 17.61 |

# Harvest aid effects on three classes of dry beans

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

| | | | |
|---|---|---|---|
| **Location:** | Richville (SVREC) | **Tillage:** | Conventional |
| **Planting Date:** | June 14, 2016 | **Row width:** | 22-inch |
| **Replicated:** | 4 times | **Soil Type:** | Sandy clay loam, 2.3% OM, pH 7.8 |
| **Varieties:** | 'Zorro' black beans | **Populations:** | 109,000 seeds/A |
| | 'Merlin' navy beans | | 109,000 seeds/A |
| | 'El Dorado' pinto beans | | 100,000 seeds/A |

*Table 1.* 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 | 77 bc[b] | 97 ab | 21.3 e | 77 b | 96 bc | 20.9 cd | 79 a | 100 a | 23.2 a |
| Gramoxone (2 pt) + NIS | 87 a | 94 b | 23.0 b-e | 86 a | 94 cd | 21.2 cd | 69 cd | 86 c | 23.3 a |
| Valor (1.5 oz) + MSO | 72 cd | 95 b | 24.4 a-d | 76 b | 92 d | 22.1 bcd | 78 ab | 96 a | 24.2 a |
| Roundup (22 fl oz) + AMS | 57 e | 88 c | 25.6 ab | 64 c | 87 e | 23.9 ab | 61 e | 89 bc | 22.4 a |
| Aim (2 fl oz) + MSO | 69 d | 76 d | 24.7 abc | 66 c | 74 f | 22.6 abc | 71 bc | 91 b | 24.5 a |
| Sharpen (2 fl oz) + MSO + AMS | 80 b | 100 a | 23.5 a-e | 76 b | 100 a | 20.8 cd | 80 a | 100 a | 22.3 a |
| Sharpen (1 fl oz) + Roundup + MSO + AMS | 77 bc | 100 a | 21.9 cde | 76 b | 98 ab | 20.9 cd | 83 a | 100 a | 23.2 a |
| Sharpen (1 fl oz) + Gramox.+ MSO + AMS | 92 a | 99 a | 21.7 de | 87 a | 98 ab | 20.3 d | 82 a | 100 a | 24.1 a |
| Untreated | 53 e | 62 e | 25.8 a | 52 d | 60 g | 24.6 a | 63 de | 77 d | 24.3 a |

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

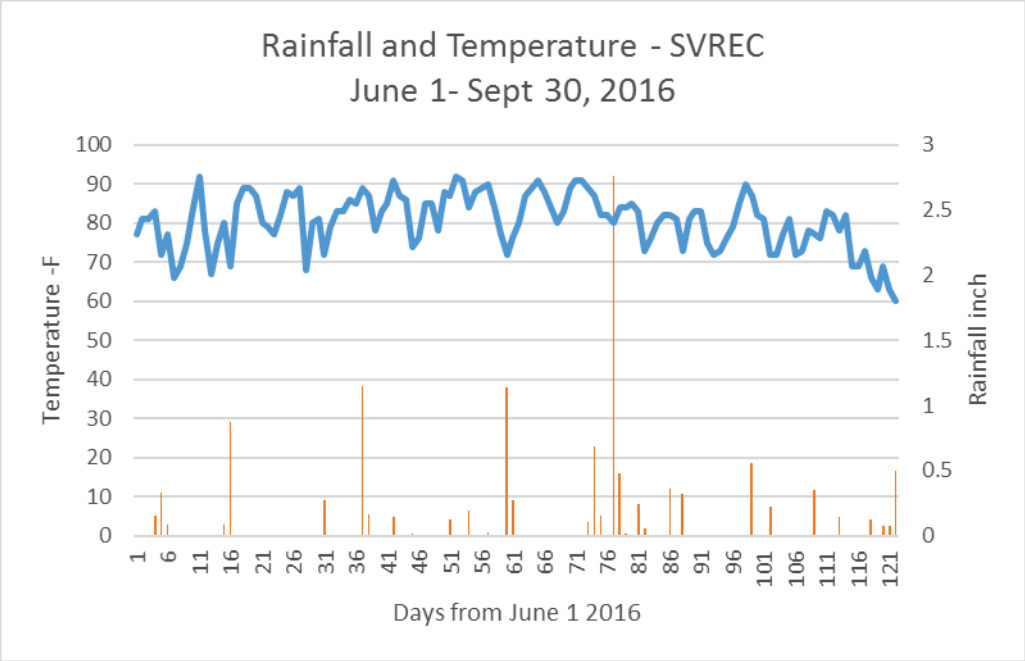
[b] Means within a column with different letters are significantly different from each other

**Summary:** This study was conducted to evaluate the effects of preharvest treatments on desiccation and yield of three classes of dry beans with differing speeds of dry down, 'Zorro' black bean (uniform dry down), 'Merlin' navy bean (green stem), and 'El Dorado' pinto bean (green stem). Preharvest applications were made when 75, 60, and 75% of the pods were yellow for 'Zorro', 'Merlin', and 'El Dorado' beans, respectively. There were some differences in the speed and effectiveness of the 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 applied to 'Merlin' navy beans was the only treatment that did not reach 90% desiccation. Yield was slightly affected by products that provided quicker desiccation for the 'Zorro' and 'Merlin' beans, due to early application (60-75% yellow pod) instead of 80% yellow pod. Overall, many of the treatments provided good bean desiccation. This research was supported by the Michigan Dry Bean Commission through the Michigan Department of Agriculture Specialty Crops grant.

# 2016 DRY BEAN YIELD TRIALS

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

The dry bean breeding program initiated its eight season on the 450 acre Saginaw Valley Research & Extension Center (SVREC) research farm near Frankenmuth MI in 2016. A total of 2001 yield trial plots (14 tests) were harvested in 2016 and 1004 single plant selections were made in the early generation nurseries. Yield trials at the SVREC included 48-entry standard navy test; 48-entry standard black test; 64-entry standard GN test: 32-entry standard pinto test; 40-entry standard red/pink test; 30-entry drought trial and 36-entry Co-op and regional test that includes pinto, GN, red and pinks from other programs. At the Montcalm Research Farm (MRF) near Entrican, MI, kidney bean yield trials were dramatically increased to include 24-entry standard kidney and bush cranberry test; 80-entry preliminary dark red kidney test; 88-entry white kidney test; 64-entry light red kidney test; 9-entry yellow bean trial and 64-entry white mold test. All trials were direct harvested except for kidney and cranberry beans at Montcalm. Weather during the early growing season was dry and hot and beans were under considerable stress during the critical flowering period in Frankenmuth (see figure). Temperatures were above average in the 2016 season and exceeded 90F during June and July. Rainfall late in August resulting in plants re-greening and setting a double crop that reflected in lower yields and necessitated chemical desiccation in commercial fields. Selection for tolerance to drought stress during the extended dry period was possible in all nurseries based on performance under these conditions. White mold plots at MRF had supplemental irrigation to encourage disease development. However, disease incidence in this nursery was very low in the susceptible checks due to high temperatures and lack of prior bean production on this particular land parcel where the nursery was located.



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. 6101: Standard Navy Bean Yield Trial**

This 48-entry trial included standard commercial navy bean varieties, and advanced lines from the MSU breeding program, which carry the N-prefix. Yields ranged from 12.1 to 25.1 cwt/acre with a mean of 18.9 cwt/acre. Variability in this trial was high (CV=13.2%) and the LSD needed for significance was 2.9 cwt/acre. Many entries failed to effectively partition and dry down properly and several exhibited severe leaf retention at maturity. Eight MSU lines significantly out-yielded the test mean and included top yielding line N14229 from 2015 trials. The top yielding entry had the highest agronomic rating (5.3) as it showed excellent dry down unlike many of the standard varieties that exhibited severe leaf retention. Three cultivars, Vigilant, Alpena and Merlin grouped around the test mean. Mist was the highest yielding Canadian variety tested at 16.3 cwt/acre. As in 2015, Mist significantly out-yielded Lighthouse, and performed significantly better than T9905, Blizzard and Medalist. Similar to 2015, Medalist was the lowest yielding variety as a result of severe leaf retention and failure to dry down. The inability of many lines to mature uniformly was the result of the early drought stress resulting in the inability of the plants to set sufficient pod load (sink) to mature out normally. Canning tests will be conducted on all new MSU breeding lines before being considered for release.

**Expt. 6102: Standard Black Bean Yield Trial**

This 48-entry trial included the standard commercial black bean varieties and advanced breeding lines. Yields ranged from 13.9 to 28.9 cwt/acre with a test mean of 23.3 cwt/acre. Variability was moderate in this test, (CV=12.4%) and the LSD was 3.4 cwt/acre. Five entries significantly outyielded the test mean and the top four lines were new B16-entries. Zenith was the top commercial variety at 25.1 cwt/acre and significantly outyielded Zorro which produced a disappointing low yield (16 cwt/a), due to drought stress. Seed size of Zenith was large at 26 g/100 seed. Entry XRAV-40-4 from Puerto Rico and BK11-8 from USDA-WA underperformed in this test. Canning tests will be conducted on new breeding lines to ensure only those with canning quality similar to Zenith are advanced.

**Expt. 6103: Standard Great Northern Yield Trial**

This 64-entry trial included MSU great northern and otebo breeding lines (G-prefix) and standard commercial check varieties. The test ranged in yield from 12.0 to 26.1 cwt/acre with a mean yield of 19.2 cwt/acre. Variability was moderate (CV= 11.9%) resulting in a LSD value of 3.1 cwt/acre needed for significance. Nine entries significantly outperformed the test mean and included the new Samurai otebo variety. In statewide testing at three locations, Samurai yielded 34.8 cwt compared to 24.0 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. New ND-line from NDSU yielded at test mean, but matured very late (110d). Drought caused some lines to mature very early or regreen and mature much later than normal. Powderhorn check variety was among the lowest yielding entries, matured earlier (97d) due to drought. Many of the new G-lines matured very late (>105d), result of regreening due to early drought stress. These lines will need to be retested to determine the adaptation under more normal conditions.

**Expt. 6104: Standard Pinto Bean Yield Trial**

This 32-entry trial included MSU pinto lines (P-prefix) and standard commercial check varieties. The test ranged in yield from 11.1 to 25.0 cwt/acre with a mean yield of 18.6 cwt/acre. Variability was moderate (CV= 10.1%) resulting in a LSD value of 2.6 cwt/acre needed for significance. Seven entries significantly outperformed the test mean and included largely new pinto P16-breeding lines. La Paz was the top yielding check compared to Eldorado and Longs Peak. We have encountered some problems with virus in P14815 and P16913 that trace back to the Longs Peak parent. Since most MSU lines carry the I gene, we overlooked the fact that Longs Peak carries the *bc-2*$^2$ gene, so were not screening progeny from those crosses. As a result, we lost virus resistance in these crosses, as we mistakenly assumed most cultivars carried the I gene. Palomino the new slow darkening pinto from NDSU underperformed in this test and in test 6106 yielding just 11 cwt/acre.

**Expt. 6105: Standard Small Red and Pink Bean Yield Trial**

This 40-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 7.8 to 25.8 cwt/acre with a mean yield of 19.5 cwt/acre. Variability was moderate (CV=11.7%) resulting in a LSD value of 3.1 cwt/acre for significance. The top ten lines mainly new R16-lines plus three small red varieties Viper, Ruby, Merlot and R12844 breeding line significantly outperformed the test mean, while Desert Song, Gypsy Rose and Rosetta pink ranked below the mean yield. Seed size of Viper (33g) and Ruby (34g) is significantly smaller than that of Merlot (41g). R12844 which has performed well in previous years continues to show yield potential combined with erectness and larger seed size (40g). Overall more progress was observed among the small red R- lines than the pink S-lines. 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. One line R16503 in particular showed promise based on high agronomic score (6.3). All lines will be evaluated for canning quality and BCMV reaction prior to advancing to 2017 trials.

**Expt. 6106: 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 36-entry trial ranged in yield from 9.2 to 32.9 cwt/acre with a mean of 20.8 cwt/acre. Variability was moderate (CV=11.0%) resulting in a LSD value (3.1 cwt/acre) for significance. As a result, twelve lines were significantly higher in yield than the test mean including varieties Samurai, Merlot, Viper and La Paz. In the top group were pinto lines from MSU, USDA-WA (PT-prefix), Colorado, and NDSU. Performance of slow darkening pintos COSD-7 from CSU and Palomino from NDSU was very poor. At this point none of the new slow darkening pintos appear to match the traditional lines in yield potential. Small red breeding line R12844 and GN line G13444 continue to show overall superior performance. This cooperative trial continues to be valuable as it allows an evaluation of potential new lines prior to release in other states. Canning quality will also be evaluated for all entries.

**Expt. 6107: National Dry Bean Drought Nursery**

This 30-entry trial was conducted at the SVREC to evaluate a series of breeding lines identified through shuttle breeding between University Nebraska and USDA-TARS station in Puerto Rico as possessing improved levels of drought stress. The trial was replicated by colleagues at various locations across the US. Yields ranged from 6.9 to 31.1 cwt/acre with a mean of 21.5 cwt/acre. Variability was moderate (CV=10.5%) and the LSD needed for significance was 3.1cwt/acre. Eleven lines significantly out-yielded the test mean, including varieties Zenith, Stampede, Eldorado and Merlot, while Marquis was the lower yielding entry. Since drought was a major factor in 2016, it was gratifying to see that 8/11top yielding lines were either MSU lines or varieties. This suggests that continued selection for high performance under local precipitation patterns has resulted in materials that exhibit improved performance under stressful conditions.

**Expt. 6208: Standard Kidney Bean Yield Trial**

This 24-entry trial was conducted on new ground on the Montcalm Research Farm (MRF) to compare the performance of standard and new light red kidney (LRK), dark red kidney (DRK), white kidney (WK), cranberry bean varieties from MSU and CDBN under supplemental irrigation (5x total 3.3") and 14/24 entries were commercial varieties. A prominent feature of this trial was lack of root rot disease pressure as noted in past years and lack of deer feeding due to erection of a deer fence. Yields ranged from 22.9 to 40.0 cwt/acre with a mean of 32.6 cwt/acre. Variability was moderate (CV=11.8%) resulting in a LSD value of 4.6 cwt/acre needed for significance. Only three lines significantly out-yielded the test mean, including the variety Chaparral and two new lines from the same cross on DRK15304 and LRK15601. The same K15304 line was in the top group in 2015. Both lines have K11306 as a parent, which ranked 4$^{th}$ in this test and is under consideration for release. These results provide a comparison of all current red and white kidney bean varieties.

**Expt. 6209: Preliminary Dark Red Kidney Bean Yield Trial**

This 80-entry trial was conducted on new ground at MRF to compare the performance of new dark red kidney (DRK) bean lines from MSU under supplemental irrigation (5x total 3.3").These entries were all survivors of the severe root rot (*Fusarium solani* species complex, clade 2) disease pressure on MRF in 2015. A prominent feature of this trial was lack of root rot disease pressure as noted in past years and lack of deer feeding due to erection of a deer fence. Yields ranged from 15.5 to 43.9 cwt/acre with a mean of 32.3 cwt/acre. Variability was well controlled (CV=7.4%) in this 3-rep experiment resulting in a LSD value of 3.2 cwt/acre needed for significance. Twenty-four lines significantly outyielded the test mean and these are all new K16-lines including LRK variety Rosie that showed excellent root rot resistance. Red Hawk, Montcalm and Snowdon varieties dropped below the test mean. These results were encouraging as we now have a large group of new DRK lines that may possess moderate levels of root rot and CBB resistance based on field ratings in 2016. Since canning quality is vital in kidney beans, only those DRK lines equivalent in canning quality to Red Hawk will be advanced in 2017.

**Expt. 6210: Preliminary Light Red Kidney Bean Yield Trial**

This 64-entry trial was conducted on new ground at MRF to compare the performance of new light red kidney (LRK) bean lines from MSU under supplemental irrigation (5x total 3.3"). These entries were all survivors of the severe root rot (*Fusarium solani* species complex, clade 2) disease pressure on MRF in 2015. A prominent feature of this trial was lack of root rot disease pressure as noted in past years and lack of deer feeding due to erection of a deer fence. Yields ranged from 19.1 to 46.4 cwt/acre with a mean of 31.1 cwt/acre. Variability was well controlled (CV=9.1%) in this 3-rep experiment resulting in a LSD value of 3.8 cwt/acre needed for significance. Eighteen lines significantly outyielded the test mean and these are all new K16-lines including LRK variety Rosie that showed excellent root rot resistance. Clouseau and CELRK varieties dropped below the test mean, due largely to heavy CBB infection (rated 5). The top entry K16640 was highly significant as it exceeded the yield of the next entry by 6.1 cwt/a. Overall the test was not as impressive as DRK test 6209, but the results were encouraging as we now have a large group of new LRK lines that may possess moderate levels of root rot and CBB resistance based on field ratings in 2016. Since canning quality is vital in kidney beans, only those LRK lines equal or better than CELRK will be advanced in 2017.

**Expt. 6211: Preliminary White Kidney Bean Yield Trial**

This 88-entry trial was conducted on new ground at MRF to compare the performance of new white kidney (WK) bean lines from MSU under supplemental irrigation (5x total 3.3"). These entries were all survivors of the severe root rot (*Fusarium solani* species complex, clade 2) disease pressure on MRF in 2015. A prominent feature of this trial was lack of root rot disease pressure as noted in past years and lack of deer feeding due to erection of a deer fence. Yields ranged from 16.3 to 43.1 cwt/acre with a mean of 29.7 cwt/acre. Variability was moderate (CV=10.9%) in this 3-rep experiment resulting in a LSD value of 4.4 cwt/acre needed for significance. Eighteen lines significantly outyielded the test mean and these are all new K16-lines and top entry K16980 exceeded the yield of the next entry by 3.4 cwt/a. Red Hawk, Snowdon and Beluga varieties dropped below the test mean. These results were encouraging as we now have a large group of new WK lines that may possess moderate levels of root rot and CBB resistance based on field ratings in 2016 that exhibit a range of maturities (93-104 d). Since canning quality is vital in kidney beans, only those WK lines equivalent to Beluga will be advanced in 2017.

**Expt. 6212: Preliminary Yellow Bean Yield Trial**

This small 10-entry trial was conducted on new ground at MRF to compare the performance of new yellow bean lines from MSU under supplemental irrigation (5x total 3.3"). These entries were all survivors of the severe root rot (*Fusarium solani* species complex, clade 2) disease pressure on MRF in 2015 and in general yellow beans showed higher level of root rot tolerance than kidney beans. The trial however was heavily infected with CBB which resulted in low yields. Yields ranged from 12.8 to 27.8 cwt/acre with a mean of 20.6 cwt/acre. Variability was high (CV=15.8%) in this 3-rep experiment resulting in a LSD value of 4.6 cwt/acre needed for significance. Only two lines significantly outyielded the test mean and these included the new Patron (DBY-28-1) variety and Y16503 from the MSU program. This is the first yellow bean test with new MSU lines that all carry

I-gene resistance to BCMNV. These results are initial efforts to breed yellow beans and greater genetic variability is needed to advance this program. We are hopeful to obtain yellow bean germplasm from East Africa to broaden the genetic base but most of these material including those from CSU are susceptible to BCMNV. The lines will be canned before being advanced in 2017.

**Expt. 6213: National White Mold Yield Trial**

This 56-entry trial was conducted on new ground at MRF 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 5 times for a total of 3.3" to maintain adequate levels of moisture for favorable disease development at the critical flowering period. White mold infection did not develop in this trial due to lack of inoculum in the new ground despite the extra irrigation. The test ranged in yield from 6.5 to 41.6 cwt/acre with a mean yield of 28.6 cwt/acre. Variability was moderate (CV=10.8%), thus a high LSD value (4.2 cwt/acre) was needed for significance. As a result, 15 lines significantly out-yielded the test mean and included Viper, Zenith, Merlot, Zorro and Rosetta varieties and a large number of new B15-black bean lines including R12844 small red line. As in past years, the navy beans underperformed the black beans. Bunsi (resistant), Beryl (susceptible) and G122 (resistant) checks were among the lowest yielding entries similar to previous years. Yields of one pink bean line was also reduced due to poor stand and vigor similar to situation in 2015 and may be root rot susceptible. This trial will continue to be part of the breeding effort to improve tolerance to white mold in future varieties in 2017.

**Expt. 6214: White Mold x Fertility Trial**

A small trial was conducted to see the interaction between N-fertility levels on the incidence of white mold in two contrasting bean cultivars, Zenith black and Viper small red. Both varieties have similar growth habits and maturities but differ in reaction to white mold. Zenith shows greater level of resistance to white mold. The trial was conducted adjacent to test 6213 and received the same irrigation amounts. Two N-treatments, 20 lbs/a and 80 lbs/a were applied to each variety using 6 replicates. Unfortunately, white mold did not develop in this trial, but the effect of N-treatments on both seed yield and seed size was quite dramatic. Seed yield was increased by over 8 cwt/a and seed size by 1.5 g at the 80 lb rate. The yield difference was highly significant and constant across varieties but Zenith outperformed Viper by 5.7 cwt/a at both treatments. Since the trial was on new ground, the soil may have lacked Rhizobium inoculum specific for beans and in general the McBride sandy loam soils at MRF are low in organic matter and require extra fertilization.

| Variety | Yield cwt/acre | | | 100 seed wt. g | | |
|---|---|---|---|---|---|---|
| | 20 lbs N | 80 lbs N | Mean | 20 lbs N | 80 lbs N | Mean |
| **Zenith** | 32.7 | 40.9 | 36.8 | 22.8 | 23.5 | 23.1 |
| **Viper** | 27.2 | 35.1 | 31.1 | 29.9 | 32.2 | 31.1 |
| **Mean** | 29.9 | 38.0 | 34.0 | 26.3 | 27.8 | 27.1 |
| **LSD .05** | | | 2.3 | | | 0.88 |
| **CV%** | | | 6.0 | | | 2.9 |

**Early Generation Breeding Material grown in Michigan in 2016**

**F3 through F5 lines**

Navy and Black - 988 lines
Pinto - 32 lines
GN - 21 lines
Pinks and Reds – 39 lines
Kidneys (DR, LR, White) - 97 lines
Yellow - 35 lines

**F2 populations**

Navy and Black -142 populations
Pinto - 27 populations
GN - 25 populations
Pinks and Reds - 32 populations
Kidneys (DR, LR, White) – 79 populations
Yellow – 2 populations

**F1 populations:** 375 different crosses among ten contrasting seed types.

# 2016 DRY BEAN YIELD TRIALS

| EXPERIMENT | TITLE | PLANTING DATE | LOCATION | | ENTRIES | DESIGN | REPS | HARVEST METHOD |
|---|---|---|---|---|---|---|---|---|
| 6101 | STANDARD NAVY BEAN YIELD TRIAL | 06/02/16 | SVR&EC | FRANKENMUTH | 48 | ALPHA LATTICE | 4 | DIRECT HARVESTED |
| 6102 | STANDARD BLACK BEAN YIELD TRIAL | 06/02/16 | SVR&EC | FRANKENMUTH | 48 | ALPHA LATTICE | 4 | DIRECT HARVESTED |
| 6103 | STANDARD GREAT NORTHERN YIELD TRIAL | 06/02/16 | SVR&EC | FRANKENMUTH | 64 | SQ. LATTICE | 3 | DIRECT HARVESTED |
| 6104 | STANDARD PINTO BEAN YIELD TRIAL | 06/02/16 | SVR&EC | FRANKENMUTH | 32 | ALPHA LATTICE | 3 | DIRECT HARVESTED |
| 6105 | STANDARD PINK & SMALL RED YIELD TRIAL | 06/02/16 | SVR&EC | FRANKENMUTH | 40 | ALPHA LATTICE | 4 | DIRECT HARVESTED |
| 6106 | MIDWEST & CO-OP. REGIONAL TRIAL | 06/03/16 | SVR&EC | FRANKENMUTH | 36 | SQ. LATTICE | 3 | DIRECT HARVESTED |
| 6107 | NATIONAL DRY BEAN DROUGHT TRIAL | 06/03/16 | SVR&EC | FRANKENMUTH | 30 | REC. LATTICE | 3 | DIRECT HARVESTED |
| 6208 | STANDARD KIDNEY BEAN YIELD TRIAL | 06/13/16 | ENTRICAN | MONTCALM | 24 | ALPHA LATTICE | 4 | ROD PULLED |
| 6209 | PRELIMINARY DARK RED KIDNEY TRIAL | 06/10/16 | ENTRICAN | MONTCALM | 80 | ALPHA LATTICE | 3 | ROD PULLED |
| 6210 | PRELIMINARY LIGHT RED KIDNEY TRIAL | 06/10/16 | ENTRICAN | MONTCALM | 64 | SQ. LATTICE | 3 | ROD PULLED |
| 6211 | PRELIMINARY WHITE KIDNEY TRIAL | 06/10/16 | ENTRICAN | MONTCALM | 88 | ALPHA LATTICE | 3 | ROD PULLED |
| 6212 | PRELIMINARY YELLOW BEAN TRIAL | 06/10/16 | ENTRICAN | MONTCALM | 9 | RCBD | 3 | ROD PULLED |
| 6213 | NATIONAL WHITE MOLD YIELD TRIAL | 06/13/16 | ENTRICAN | MONTCALM | 56 | REC. LATTICE | 3 | DIRECT HARVESTED |

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.
PESTICIDES APPLIED: 9.6 OZ. ASANA ON JULY 11.

ENTRICAN: FERTILIZER BROADCAST: 200 POUNDS OF 19-10-19 PRIOR TO PLANTING. 50 POUNDS 46-0-0 SIDE DRESSED ON JULY 19.
HERBICIDES APPLIED: 2 PT. SONALAN/1.25 QT EPTAM/2PT. DUAL PPI. 4 OZ. RAPTOR/14 OZ. REFLEX/1 PT BASAGRAN ON JULY 12.
PESTICIDES APPLIED: 9.6 OZ. ASANA ON JULY 12.
IRRIGATION APPLIED: 3.3 INCHES - 5 APPLICATIONS ON ALL TRIALS;

**EXPERIMENT 6101 STANDARD NAVY YIELD TRIAL** **PLANTED: 6/2/16**

| 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 | 1 | 25.1 | 19.9 | 46.0 | 97 | 1.3 | 53.0 | 5.3 | 2.0 |
| N14201 | N11249/N11256 | 6 | 24.7 | 21.9 | 49.0 | 99 | 2.0 | 53.8 | 4.5 | 2.0 |
| N15326 | N12405/N12468 | 36 | 24.5 | 18.8 | 45.0 | 95 | 1.0 | 47.3 | 4.3 | 1.0 |
| N14243 | N11284/N11277 | 4 | 23.9 | 20.6 | 47.0 | 95 | 1.0 | 50.5 | 4.0 | 4.0 |
| N15331 | N12438/N12468 | 22 | 23.8 | 20.1 | 45.0 | 95 | 1.8 | 50.8 | 5.0 | 3.0 |
| N15335 | N12453/N11277 | 27 | 22.9 | 20.4 | 44.0 | 96 | 1.0 | 51.0 | 4.3 | 2.0 |
| N15313 | N11258/N11277 | 33 | 21.9 | 18.8 | 47.0 | 93 | 1.0 | 49.5 | 3.8 | 3.0 |
| N14230 | N11275/N11256 | 5 | 21.8 | 20.5 | 48.0 | 98 | 2.0 | 53.5 | 5.0 | 3.0 |
| N13120 | N08003/N05324 | 10 | 21.4 | 22.9 | 44.0 | 96 | 1.0 | 50.5 | 4.8 | 2.0 |
| N16401 | N09175/Alpena | 42 | 21.4 | 22.1 | 44.0 | 94 | 1.0 | 48.3 | 4.0 | 1.0 |
| N16405 | N12466/N11264 | 46 | 21.4 | 18.1 | 46.0 | 95 | 1.8 | 51.3 | 5.3 | 2.0 |
| N16404 | N12454/N12440 | 45 | 21.2 | 21.3 | 44.0 | 96 | 1.5 | 47.0 | 3.8 | 2.0 |
| N15339 | N12468/N11292 | 28 | 21.0 | 18.5 | 48.0 | 99 | 1.8 | 53.0 | 4.8 | 2.0 |
| N14210 | N11256/N11262 | 11 | 21.0 | 24.3 | 47.0 | 97 | 1.5 | 48.8 | 3.5 | 2.0 |
| N15337 | N12466/N11258 | 37 | 20.3 | 20.6 | 46.0 | 96 | 1.5 | 51.8 | 4.8 | 2.0 |
| N14218 | N11256/N11298 | 2 | 19.9 | 19.6 | 47.0 | 96 | 1.0 | 52.3 | 5.5 | 3.0 |
| N14205 | N11256/N11258 | 17 | 19.7 | 22.2 | 49.0 | 98 | 1.3 | 53.8 | 5.0 | 3.0 |
| N16406 | Alpena//N11238/N09034 | 47 | 19.7 | 22.7 | 47.0 | 96 | 1.0 | 53.0 | 5.0 | 2.0 |
| N15306 | N11230/N11298 | 30 | 19.5 | 22.9 | 47.0 | 99 | 1.0 | 54.5 | 4.8 | 2.0 |
| N15320 | N11277/N11258 | 38 | 19.5 | 23.3 | 48.0 | 98 | 1.0 | 53.0 | 4.3 | 2.0 |
| N14225 | N11257/N11280 | 12 | 19.2 | 22.8 | 50.0 | 98 | 2.5 | 46.3 | 2.8 | 3.0 |
| N15341 | N12468/N12466 | 25 | 19.2 | 20.4 | 47.0 | 96 | 1.3 | 51.3 | 5.3 | 2.0 |
| I10101 | COOP 02084, **VIGILANT** | 41 | 19.1 | 22.0 | 47.0 | 96 | 1.0 | 52.0 | 3.8 | 5.0 |
| N11283 | MEDALIST/N08003, **ALPENA** | 7 | 18.8 | 20.9 | 45.0 | 99 | 1.0 | 53.5 | 5.0 | 2.0 |
| I11264 | COOP 03019, **MERLIN** | 8 | 18.8 | 19.7 | 45.0 | 97 | 1.0 | 51.0 | 3.8 | 3.0 |
| N16407 | Alpena//N11238/N09034 | 48 | 18.8 | 21.4 | 47.0 | 98 | 1.0 | 53.5 | 4.3 | 3.0 |
| N14223 | N11257/N11256 | 19 | 18.6 | 19.9 | 45.0 | 99 | 2.0 | 49.5 | 3.8 | 2.0 |
| N14216 | N11256/N11292 | 13 | 18.2 | 20.9 | 46.0 | 99 | 1.3 | 54.5 | 4.5 | 2.0 |
| N13142 | N08007/N09046 | 3 | 18.2 | 20.6 | 46.0 | 100 | 1.8 | 49.0 | 3.8 | 2.0 |
| N15346 | N09020/B09204//B10238/B11343 | 31 | 18.1 | 17.8 | 46.0 | 92 | 1.0 | 45.8 | 3.5 | 4.0 |
| N15336 | N12466/N11238 | 32 | 18.0 | 17.3 | 45.0 | 97 | 1.0 | 51.5 | 4.0 | 3.0 |
| N14240 | Alpena/N11264 | 18 | 17.8 | 22.5 | 47.0 | 96 | 1.5 | 50.8 | 4.0 | 3.0 |
| N14206 | N11256/N11258 | 14 | 17.7 | 21.7 | 48.0 | 99 | 1.0 | 52.8 | 4.3 | 2.0 |
| N16402 | N11231/Alpena | 43 | 16.9 | 20.4 | 45.0 | 100 | 1.3 | 54.8 | 4.5 | 2.0 |
| N15340 | N12468/N11298 | 40 | 16.9 | 27.0 | 50.0 | 98 | 1.3 | 53.0 | 5.3 | 1.0 |

**EXPERIMENT 6101 STANDARD NAVY YIELD TRIAL** **PLANTED: 6/2/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| N15321 | N11277/N11258 | 29 | 16.9 | 22.7 | 46.0 | 95 | 1.0 | 51.8 | 3.8 | 4.0 |
| I15621 | **MIST** | 15 | 16.3 | 20.9 | 44.0 | 100 | 1.0 | 51.3 | 3.5 | 1.0 |
| N15319 | N11277/N09034 | 34 | 16.3 | 20.7 | 46.0 | 97 | 1.0 | 50.0 | 4.0 | 2.0 |
| N14238 | Alpena/N11249 | 16 | 16.2 | 20.1 | 45.0 | 96 | 1.0 | 50.0 | 4.0 | 3.0 |
| N15318 | N11277/N09034 | 24 | 16.1 | 22.6 | 46.0 | 96 | 1.5 | 49.0 | 3.5 | 3.0 |
| N14247 | B11343/B11271 | 9 | 15.7 | 20.3 | 47.0 | 97 | 1.0 | 53.5 | 5.3 | 2.0 |
| I08902 | **HYLAND T9905** | 20 | 15.5 | 24.0 | 47.0 | 100 | 1.5 | 51.8 | 3.8 | 2.0 |
| N15328 | N12405/N12468 | 39 | 15.4 | 19.8 | 46.0 | 95 | 1.0 | 51.8 | 4.8 | 4.0 |
| I16725 | 08072, **BLIZZARD** | 23 | 15.2 | 23.5 | 46.0 | 98 | 1.3 | 53.5 | 4.0 | 2.0 |
| N15345 | N11258//N11264/Merlin | 26 | 14.9 | 23.8 | 49.0 | 99 | 1.5 | 52.3 | 4.3 | 3.0 |
| N16403 | N12440/N11257 | 44 | 14.2 | 23.1 | 45.0 | 98 | 1.0 | 50.5 | 5.0 | 2.0 |
| I08958 | Mayflower/Avanti, **MEDALIST** | 21 | 13.3 | 22.3 | 47.0 | 100 | 1.5 | 51.8 | 3.8 | 2.0 |
| I15628 | **LIGHTHOUSE** | 35 | 12.1 | 21.3 | 45.0 | 101 | 1.0 | 50.0 | 3.8 | 1.0 |
| MEAN (48) | | | 18.9 | 21.2 | 46.1 | 97.0 | 1.3 | 51.3 | 4.3 | 2.4 |
| LSD (.05) | | | 2.9 | 0.9 | 1.1 | 1.2 | 0.4 | 1.2 | 0.7 | (1 rep) |
| CV (%) | | | 13.2 | 3.7 | 1.4 | 1.1 | 25.7 | 2.1 | 13.6 | 35.9 |

**EXPERIMENT 6102 STANDARD BLACK YIELD TRIAL** **PLANTED: 6/2/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| B16504 | Zenith//Alpena*/B09197 | 37 | 28.9 | 23.6 | 46.0 | 98 | 1.5 | 53.8 | 4.5 | 2.0 |
| B16506 | B11363//Alpena*/B09197 | 39 | 28.6 | 22.5 | 44.0 | 94 | 1.0 | 48.8 | 4.0 | 3.0 |
| B16507 | B12720/Zenith | 40 | 27.3 | 27.5 | 46.0 | 96 | 1.0 | 52.8 | 4.8 | 2.0 |
| B16501 | Zenith/B10215 | 34 | 27.2 | 24.1 | 45.0 | 93 | 1.0 | 49.8 | 4.3 | 2.0 |
| B15417 | B10208/B09175 | 20 | 27.1 | 25.0 | 46.0 | 99 | 1.0 | 52.8 | 4.8 | 1.0 |
| B15442 | B11363/B09175 | 2 | 26.6 | 27.2 | 46.0 | 99 | 1.0 | 52.3 | 4.0 | 3.0 |
| B15408 | B09175/B10215 | 1 | 26.5 | 24.4 | 44.0 | 96 | 1.3 | 49.3 | 3.8 | 4.0 |
| B16511 | B13204//Alpena*/B09197 | 44 | 26.2 | 25.6 | 45.0 | 96 | 1.0 | 50.3 | 4.3 | 2.0 |
| B15416 | B10208/B09175 | 6 | 26.1 | 30.2 | 47.0 | 99 | 1.5 | 50.5 | 3.8 | 2.0 |
| B15414 | B09175/B11611 | 15 | 25.9 | 29.3 | 45.0 | 99 | 1.8 | 50.3 | 4.0 | 2.0 |
| B16512 | B13204//Alpena*/B09197 | 45 | 25.8 | 24.8 | 45.0 | 96 | 1.0 | 51.3 | 4.0 | 4.0 |
| B15418 | B10208/B09175 | 3 | 25.3 | 27.0 | 45.0 | 98 | 1.0 | 51.8 | 4.8 | 4.0 |
| B15432 | Zenith/B12721 | 21 | 25.2 | 26.9 | 46.0 | 97 | 1.0 | 53.3 | 4.3 | 4.0 |
| B10244 | B04644/ZORRO, **ZENITH** | 27 | 25.1 | 26.0 | 46.0 | 99 | 1.0 | 52.8 | 4.3 | 3.0 |
| B16505 | B11363//Alpena*/B09197 | 38 | 24.9 | 23.5 | 44.0 | 92 | 1.0 | 49.0 | 4.5 | 2.0 |
| B15451 | B11371/B11363 | 7 | 24.8 | 22.4 | 47.0 | 97 | 1.0 | 53.3 | 4.8 | 2.0 |
| B15427 | Zenith/B11343 | 18 | 24.6 | 25.0 | 44.0 | 93 | 1.0 | 49.5 | 4.3 | 3.0 |
| B15430 | Zenith/B12721 | 8 | 24.4 | 25.6 | 44.0 | 95 | 1.3 | 51.3 | 4.5 | 4.0 |
| B15464 | B12709/B12721 | 23 | 24.4 | 27.6 | 46.0 | 98 | 1.0 | 54.3 | 6.0 | 2.0 |
| B16508 | B12720/Zenith | 41 | 24.4 | 29.4 | 45.0 | 98 | 1.0 | 52.3 | 4.3 | 2.0 |
| B15443 | B11363/B09175 | 25 | 24.2 | 27.4 | 46.0 | 98 | 1.0 | 49.8 | 4.0 | 2.0 |
| B15453 | B11371/B11363 | 10 | 24.0 | 24.4 | 46.0 | 95 | 1.3 | 52.3 | 5.5 | 1.0 |
| B16503 | Zenith/B12720 | 36 | 23.7 | 27.6 | 47.0 | 97 | 1.3 | 52.3 | 4.5 | 1.0 |
| B15434 | Zenith/B12721 | 13 | 23.6 | 25.9 | 46.0 | 98 | 1.3 | 53.8 | 4.8 | 2.0 |
| B15447 | B11363/Zenith | 28 | 23.4 | 25.7 | 45.0 | 97 | 1.0 | 52.3 | 4.3 | 3.0 |
| B16510 | B12720/B11363 | 43 | 23.1 | 22.9 | 46.0 | 98 | 1.5 | 51.8 | 4.5 | 2.0 |
| B15438 | B11334/Zenith | 19 | 23.1 | 22.4 | 44.0 | 97 | 1.3 | 50.8 | 4.0 | 2.0 |
| B15411 | B09175/B11363 | 29 | 22.7 | 21.6 | 46.0 | 97 | 1.0 | 49.3 | 4.0 | 2.0 |
| B16502 | Zenith/B12710 | 35 | 22.6 | 24.0 | 45.0 | 98 | 1.0 | 52.8 | 4.0 | 2.0 |
| B15421 | B10208/B11611 | 16 | 22.5 | 23.4 | 44.0 | 96 | 1.0 | 49.8 | 3.8 | 2.0 |
| I03390 | ND9902621-2, **ECLIPSE** | 33 | 22.5 | 23.1 | 44.0 | 93 | 1.0 | 49.0 | 3.8 | 2.0 |
| B15439 | B11334/Zenith | 22 | 22.4 | 21.9 | 46.0 | 97 | 1.0 | 53.0 | 4.5 | 2.0 |
| B15419 | B10208/B09175 | 24 | 22.4 | 27.6 | 46.0 | 99 | 1.5 | 51.3 | 4.3 | 2.0 |
| B16509 | B12720/B11363 | 42 | 22.4 | 21.5 | 44.0 | 96 | 1.0 | 50.0 | 4.0 | 3.0 |
| B15433 | Zenith/B12721 | 9 | 22.3 | 25.6 | 46.0 | 98 | 1.0 | 54.5 | 4.5 | 3.0 |

**EXPERIMENT 6102 STANDARD BLACK YIELD TRIAL** **PLANTED: 6/2/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| B15441 | B11343/B10213 | 5 | 22.3 | 22.0 | 43.0 | 93 | 1.0 | 47.8 | 3.8 | 2.0 |
| B15407 | B09175/B10215 | 4 | 22.2 | 26.4 | 47.0 | 99 | 1.8 | 50.8 | 4.0 | 2.0 |
| B15431 | Zenith/B12721 | 12 | 22.0 | 25.0 | 44.0 | 96 | 1.0 | 51.3 | 3.8 | 3.0 |
| B15410 | B09175/B11343 | 17 | 22.0 | 22.1 | 45.0 | 97 | 1.0 | 53.3 | 4.8 | 2.0 |
| B15435 | Zenith/B12721 | 14 | 22.0 | 26.3 | 46.0 | 99 | 1.0 | 52.3 | 4.3 | 3.0 |
| B16513 | Alpena*/B09197//B12720 | 46 | 21.6 | 23.8 | 46.0 | 99 | 1.3 | 51.0 | 4.5 | 2.0 |
| B15457 | B11594/Zenith | 31 | 21.1 | 26.2 | 45.0 | 97 | 1.5 | 51.8 | 4.5 | 2.0 |
| B15404 | B09175/Zorro | 26 | 20.9 | 24.3 | 46.0 | 95 | 1.0 | 49.0 | 3.5 | 4.0 |
| B15425 | Zenith/B10215 | 11 | 17.7 | 23.0 | 45.0 | 97 | 1.3 | 50.8 | 3.8 | 4.0 |
| B15426 | Zenith/B11343 | 30 | 17.5 | 21.5 | 46.0 | 99 | 1.0 | 51.3 | 3.8 | 5.0 |
| I16708 | XRAV-40-4 | 47 | 16.6 | 22.3 | 45.0 | 94 | 1.0 | 47.8 | 3.8 | 3.0 |
| B04554 | B00103*/X00822, **ZORRO** | 32 | 16.0 | 20.9 | 45.0 | 99 | 1.0 | 52.3 | 4.0 | 2.0 |
| I16709 | BK 11-8 | 48 | 13.9 | 22.4 | 45.0 | 93 | 1.5 | 49.3 | 3.3 | 2.0 |
| MEAN (48) | MEAN (48) | | 23.3 | 24.8 | 45.1 | 96.6 | 1.1 | 51.2 | 4.2 | 2.5 |
| LSD (.05) | LSD (.05) | | 3.4 | 1.0 | 0.7 | 1.6 | 0.4 | 1.9 | 0.7 | (1-rep) |
| CV (%) | CV (%) | | 12.4 | 3.5 | 0.9 | 1.4 | 27.1 | 3.1 | 13.3 | 35.6 |

**EXPERIMENT 6103 STANDARD GREAT NORTHERN AND TEBO YIELD TRIAL** **PLANTED: 6/2/16**

| NAME | PEDIGREE | ENTRY | YIELD CWT /ACRE | 100 SEED WT. (g) | DAYS TO FLOWER | DAYS TO MATURITY | LODGING (1-5) | HEIGHT (cm) | DES. SCORE |
|---|---|---|---|---|---|---|---|---|---|
| G16351 | Eldorado/G13467 | 64 | 26.1 | 45.5 | 45.0 | 108 | 1.3 | 60.0 | 4.0 |
| G16346 | G13455/G13478 | 59 | 26.1 | 46.9 | 47.0 | 105 | 1.0 | 55.7 | 5.0 |
| G16318 | G11438/G12502 | 31 | 25.7 | 42.3 | 44.0 | 102 | 1.0 | 51.3 | 4.0 |
| G16301 | Powderhorn/GN9-4 | 14 | 25.2 | 36.7 | 44.0 | 97 | 1.0 | 50.7 | 4.3 |
| G12901 | G07321/Fuji, **SAMURAI** | 1 | 24.7 | 26.5 | 46.0 | 108 | 2.3 | 53.7 | 4.0 |
| G16309 | G11404/G12502 | 22 | 24.5 | 36.0 | 45.0 | 99 | 1.0 | 51.7 | 5.0 |
| G16350 | Eldorado/G13467 | 63 | 23.8 | 40.5 | 43.0 | 109 | 1.0 | 55.0 | 3.3 |
| G16341 | G13467/G13463 | 54 | 23.0 | 34.3 | 46.0 | 110 | 1.3 | 57.0 | 3.3 |
| G16339 | G12508/G13478 | 52 | 22.8 | 34.5 | 47.0 | 103 | 1.7 | 53.0 | 5.0 |
| G14510 | G11471/G11469 | 2 | 21.9 | 35.1 | 49.0 | 110 | 1.0 | 56.7 | 3.3 |
| G16314 | G11429/G11438 | 27 | 21.8 | 39.1 | 43.0 | 109 | 1.0 | 55.7 | 4.3 |
| G14503 | G11404/G11469 | 5 | 21.7 | 41.4 | 44.0 | 101 | 1.0 | 52.7 | 4.0 |
| G16338 | G12508/G11429 | 51 | 21.6 | 37.8 | 50.0 | 109 | 2.0 | 51.7 | 3.7 |
| G16317 | G11438/G11464 | 30 | 21.4 | 43.3 | 44.0 | 102 | 1.0 | 52.7 | 4.3 |
| G16349 | G13455/G11429 | 62 | 21.1 | 35.0 | 42.0 | 106 | 1.0 | 54.7 | 4.3 |
| G16305 | Powderhorn/G12501 | 18 | 20.8 | 41.3 | 43.0 | 105 | 1.0 | 54.3 | 4.3 |
| G16306 | Powderhorn/G12501 | 19 | 20.8 | 38.0 | 45.0 | 107 | 1.0 | 53.0 | 3.7 |
| G16328 | G12508/G11464 | 41 | 20.7 | 37.0 | 43.0 | 99 | 1.0 | 52.0 | 4.7 |
| G16342 | G13467/G13455 | 55 | 20.5 | 39.5 | 44.0 | 110 | 1.3 | 57.3 | 3.3 |
| G16347 | G13467/G11429 | 60 | 20.5 | 40.7 | 50.0 | 107 | 1.3 | 55.7 | 4.3 |
| G16319 | G11464/G11404 | 32 | 20.3 | 37.2 | 42.0 | 99 | 1.0 | 51.0 | 4.0 |
| G16324 | G12502/Powderhorn | 37 | 20.2 | 39.3 | 41.0 | 101 | 1.0 | 52.7 | 4.7 |
| G16308 | G11404/G12502 | 21 | 20.0 | 38.7 | 43.0 | 105 | 1.7 | 52.3 | 4.0 |
| I15652 | ND121630 | 13 | 19.7 | 43.1 | 45.0 | 110 | 1.0 | 54.7 | 3.3 |
| G16311 | G11416/G11438 | 24 | 19.7 | 36.5 | 43.0 | 105 | 1.3 | 52.7 | 4.0 |
| G16332 | G11429/Eldorado | 45 | 19.6 | 35.2 | 45.0 | 110 | 1.7 | 54.3 | 3.3 |
| G16345 | G12508/G13455 | 58 | 19.5 | 37.4 | 43.0 | 109 | 1.0 | 55.3 | 4.0 |
| G16344 | Powderhorn//GN9-4/G12501 | 57 | 19.2 | 33.8 | 43.0 | 99 | 1.0 | 50.0 | 4.0 |
| G14506 | G11469/G11417 | 3 | 19.2 | 36.3 | 47.0 | 110 | 1.3 | 53.3 | 3.0 |
| G16312 | G11416/G11438 | 25 | 19.1 | 36.6 | 44.0 | 106 | 1.0 | 53.0 | 4.0 |
| G16310 | G11404/G12502 | 23 | 19.1 | 41.4 | 44.0 | 110 | 1.3 | 54.0 | 3.0 |
| G16316 | G11438/G11404 | 29 | 19.0 | 37.4 | 42.0 | 105 | 1.0 | 53.0 | 4.3 |
| G16336 | G12508/G11429 | 49 | 18.9 | 34.7 | 50.0 | 108 | 2.3 | 52.3 | 4.0 |
| G16320 | G11464/G12502 | 33 | 18.9 | 35.7 | 42.0 | 106 | 1.7 | 53.0 | 4.0 |
| G16334 | G11429/G11438 | 47 | 18.8 | 36.4 | 47.0 | 109 | 2.0 | 53.7 | 3.3 |

**EXPERIMENT 6103 STANDARD GREAT NORTHERN AND TEBO YIELD TRIAL** **PLANTED: 6/2/16**

| NAME | PEDIGREE | ENTRY | YIELD CWT /ACRE | 100 SEED WT. (g) | DAYS TO FLOWER | DAYS TO MATURITY | LODGING (1-5) | HEIGHT (cm) | DES. SCORE |
|---|---|---|---|---|---|---|---|---|---|
| G16304 | Powderhorn/G12501 | 17 | 18.5 | 38.9 | 42.0 | 97 | 1.0 | 49.3 | 3.7 |
| G14505 | G11429/P08175 | 4 | 18.5 | 26.2 | 44.0 | 105 | 1.0 | 54.0 | 4.0 |
| G13444 | G07302//G08274/P08410 | 9 | 18.5 | 40.3 | 42.0 | 105 | 1.0 | 50.3 | 3.7 |
| G16315 | G11438/Powderhorn | 28 | 18.4 | 36.0 | 43.0 | 101 | 1.0 | 51.7 | 4.0 |
| G13456 | G08217//P08372/P08410 | 11 | 18.1 | 39.4 | 43.0 | 103 | 1.0 | 50.3 | 3.3 |
| G16331 | GN9-4/G12501 | 44 | 18.0 | 33.2 | 43.0 | 96 | 1.0 | 49.7 | 3.7 |
| G16303 | Powderhorn/G11416 | 16 | 17.8 | 42.6 | 43.0 | 98 | 1.0 | 49.3 | 4.0 |
| G16325 | G12508/G11416 | 38 | 17.8 | 35.0 | 43.0 | 107 | 1.3 | 52.0 | 4.0 |
| G16321 | G11464/G12502 | 34 | 17.8 | 38.7 | 43.0 | 107 | 1.0 | 52.7 | 3.7 |
| G16337 | G12508/G11429 | 50 | 17.8 | 35.2 | 50.0 | 108 | 2.0 | 52.3 | 3.7 |
| G16307 | G11404/G11416 | 20 | 17.6 | 36.6 | 44.0 | 111 | 2.0 | 53.7 | 3.0 |
| G13468 | G08259//Eldorado/G08210 | 6 | 17.4 | 40.0 | 46.0 | 110 | 1.3 | 54.7 | 3.3 |
| G08254 | G04514/Matterhorn, **POWDERHORN** | 12 | 17.3 | 39.2 | 41.0 | 97 | 1.0 | 49.7 | 4.0 |
| G14525 | P09425/G11429 | 7 | 16.8 | 43.6 | 42.0 | 109 | 1.3 | 53.3 | 3.0 |
| G16323 | G11464/G12508 | 36 | 16.8 | 37.3 | 42.0 | 103 | 1.0 | 52.3 | 4.0 |
| G16330 | GN9-4/G12501 | 43 | 16.7 | 29.2 | 44.0 | 97 | 1.0 | 49.3 | 4.3 |
| G16313 | G11429/G11438 | 26 | 16.6 | 36.5 | 43.0 | 109 | 1.3 | 53.7 | 3.3 |
| G16302 | G08254/GN9-4 | 15 | 16.5 | 36.2 | 44.0 | 97 | 1.0 | 50.7 | 4.0 |
| G16343 | Powderhorn//GN9-4/G12501 | 56 | 16.3 | 31.4 | 44.0 | 99 | 1.7 | 52.3 | 4.3 |
| G16329 | G12508/Stampede-R | 42 | 16.3 | 26.6 | 42.0 | 101 | 1.0 | 50.7 | 4.0 |
| G16322 | G11464/G12502 | 35 | 16.2 | 34.4 | 43.0 | 104 | 1.0 | 51.0 | 4.0 |
| G16333 | G11429/G11438 | 46 | 16.1 | 37.0 | 46.0 | 109 | 1.7 | 52.3 | 3.3 |
| G16335 | G11429/G13467 | 48 | 15.9 | 41.9 | 49.0 | 110 | 1.3 | 55.3 | 3.7 |
| G16348 | ND09708/P12603 | 61 | 15.7 | 38.5 | 43.0 | 109 | 1.7 | 53.7 | 3.7 |
| G13479 | Eldorado/G09312 | 10 | 14.9 | 33.8 | 43.0 | 107 | 1.0 | 54.7 | 4.0 |
| G16326 | G12508/G11438 | 39 | 14.7 | 34.4 | 43.0 | 97 | 1.0 | 49.7 | 4.0 |
| G16352 | Stampede-R/G12502 | 8 | 12.5 | 43.4 | 44.0 | 110 | 1.0 | 54.0 | 3.0 |
| G16327 | G12508/G11438 | 40 | 12.5 | 32.7 | 42.0 | 97 | 1.0 | 49.3 | 4.3 |
| G16340 | G12508/G13478 | 53 | 12.0 | 33.5 | 50.0 | 108 | 1.7 | 54.0 | 3.7 |
| MEAN (64) | | | 19.2 | 37.2 | 44.1 | 104.8 | 1.3 | 52.9 | 3.9 |
| LSD (.05) | | | 3.1 | 1.7 | 0.7 | 3.5 | 0.4 | 1.4 | 0.6 |
| CV (%) | | | 11.9 | 3.4 | 0.9 | 2.4 | 26.5 | 1.9 | 10.7 |

**EXPERIMENT 6104 STANDARD PINTO YIELD TRIAL** **PLANTED: 6/2/16**

| NAME | PEDIGREE | ENTRY | YIELD CWT /ACRE | 100 SEED WT. (g) | DAYS TO FLOWER | DAYS TO MATURITY | LODGING (1-5) | HEIGHT (cm) | DES. SCORE |
|---|---|---|---|---|---|---|---|---|---|
| P16911 | P12610/P11519 | 21 | 25.0 | 39.0 | 44.0 | 101 | 1.0 | 54.0 | 5.3 |
| P16902 | P11519/P12610 | 12 | 24.0 | 39.5 | 45.0 | 102 | 1.0 | 52.3 | 4.7 |
| P14812 | P09425/P08161 | 6 | 22.7 | 42.8 | 43.0 | 97 | 1.0 | 50.0 | 4.0 |
| P16913 | P12610/LONG'S PEAK | 23 | 22.3 | 43.8 | 46.0 | 101 | 1.0 | 51.7 | 6.0 |
| P16905 | P11519/P12610 | 15 | 21.8 | 41.7 | 46.0 | 104 | 1.3 | 54.3 | 4.7 |
| P16909 | P12604/P12610 | 19 | 21.6 | 40.4 | 45.0 | 104 | 1.0 | 53.3 | 4.3 |
| P16901 | Eldorado/P11519 | 11 | 21.6 | 43.7 | 47.0 | 104 | 1.7 | 53.3 | 4.3 |
| P16903 | P11519/P12610 | 13 | 20.8 | 40.6 | 45.0 | 100 | 1.0 | 53.3 | 5.3 |
| P16918 | CO 91212-3/P12613 | 28 | 20.7 | 40.6 | 44.0 | 100 | 1.0 | 50.3 | 4.3 |
| P16914 | P11519/G13467 | 24 | 20.0 | 40.1 | 47.0 | 104 | 1.3 | 54.3 | 4.0 |
| P16908 | P12604/P12610 | 18 | 19.6 | 39.0 | 44.0 | 102 | 1.0 | 50.7 | 3.7 |
| I07113 | PNE-6-94-75/Kodiak, **LAPAZ** | 2 | 19.2 | 42.4 | 46.0 | 103 | 2.0 | 53.7 | 4.0 |
| P14814 | P11522/LONG'S PEAK | 4 | 19.1 | 47.5 | 47.0 | 107 | 1.3 | 53.7 | 4.0 |
| P14815 | P11522/LONG'S PEAK | 3 | 18.7 | 41.3 | 44.0 | 103 | 1.0 | 55.3 | 4.7 |
| P16910 | P12610/P11519 | 20 | 18.6 | 38.2 | 44.0 | 103 | 1.0 | 54.0 | 5.0 |
| P16906 | P11519/P12610 | 16 | 18.6 | 36.3 | 44.0 | 98 | 1.0 | 51.0 | 4.3 |
| P16907 | P12604/P12610 | 17 | 18.2 | 35.9 | 45.0 | 99 | 1.0 | 50.0 | 4.3 |
| P14802 | P08162/P11518 | 5 | 18.2 | 44.3 | 46.0 | 104 | 1.7 | 53.3 | 4.0 |
| P16904 | P11519/P12610 | 14 | 18.0 | 41.7 | 45.0 | 103 | 1.0 | 54.0 | 5.3 |
| P16917 | CO 91212-3/P12610 | 27 | 17.9 | 40.0 | 46.0 | 104 | 1.0 | 51.3 | 4.0 |
| P16920 | 15-16T395 | 30 | 17.8 | 40.0 | 42.0 | 105 | 1.0 | 55.3 | 4.0 |
| P07863 | AN-37/P02630, **ELDORADO** | 1 | 17.7 | 41.3 | 44.0 | 108 | 2.3 | 54.0 | 4.0 |
| P11519 | SANTA FE/P07806 | 10 | 17.6 | 44.6 | 49.0 | 104 | 1.7 | 55.7 | 4.0 |
| P16915 | P12613/P13704 | 25 | 17.3 | 35.8 | 43.0 | 97 | 1.0 | 49.7 | 3.7 |
| P16912 | P12610/P12604 | 22 | 16.8 | 41.7 | 46.0 | 102 | 1.0 | 52.3 | 4.3 |
| P13701 | G09305/Eldorado | 7 | 16.5 | 36.3 | 45.0 | 104 | 1.0 | 50.0 | 3.3 |
| I09109 | CO55646, **LONG'S PEAK** | 9 | 15.7 | 38.5 | 44.0 | 106 | 1.0 | 53.7 | 4.0 |
| P11523 | P04203/P06125 | 31 | 15.6 | 42.3 | 44.0 | 102 | 1.0 | 51.0 | 4.0 |
| I15647 | CO 14790-3 | 32 | 15.5 | 40.8 | 47.0 | 108 | 2.0 | 52.7 | 4.0 |
| P16916 | P13704/Medicine Hat | 26 | 15.0 | 38.8 | 43.0 | 102 | 1.0 | 53.0 | 3.3 |
| P16919 | PT11-61/P12610 | 29 | 13.3 | 36.8 | 44.0 | 104 | 1.0 | 51.0 | 3.0 |
| I14520 | Santa Fe/PS08-108, SF103-8, **PALOMINO** | 8 | 11.1 | 28.9 | 43.0 | 104 | 1.3 | 52.7 | 3.7 |
| MEAN (32) | MEAN (32) | | 18.6 | 40.1 | 44.7 | 102.8 | 1.2 | 52.7 | 4.2 |
| LSD (.05) | LSD (.05) | | 2.6 | 1.4 | 2.7 | 3.6 | 0.3 | 1.6 | 0.7 |
| CV (%) | CV (%) | | 10.1 | 2.6 | 3.5 | 2.6 | 20.7 | 2.2 | 11.9 |

**EXPERIMENT 6105 STANDARD RED AND PINK YIELD TRIAL** **PLANTED: 6/2/16**

| NAME | PEDIGREE | ENTRY | YIELD CWT /ACRE | 100 SEED WT. (g) | DAYS TO FLOWER | DAYS TO MATURITY | LODGING (1-5) | HEIGHT (cm) | DES. SCORE |
|---|---|---|---|---|---|---|---|---|---|
| I13401 | SR 09303, **VIPER** | 1 | 25.8 | 33.1 | 49.0 | 106 | 1.0 | 53.7 | 4.0 |
| S16808 | S08418/S12906 | 38 | 24.5 | 36.6 | 44.0 | 100 | 1.0 | 51.7 | 4.7 |
| R12844 | SR9-5/R09508 | 5 | 24.1 | 40.1 | 47.0 | 105 | 1.0 | 54.3 | 4.3 |
| I13446 | SR 09304, **RUBY** | 2 | 24.0 | 34.1 | 48.0 | 104 | 2.0 | 49.3 | 4.0 |
| R16512 | R12840/R13026 | 22 | 23.6 | 35.3 | 44.0 | 100 | 1.0 | 53.3 | 4.0 |
| R16518 | S12909/I13423 | 28 | 23.3 | 36.6 | 45.0 | 103 | 1.0 | 51.3 | 4.3 |
| R16503 | R12859/R13506 | 13 | 23.0 | 35.5 | 46.0 | 105 | 1.0 | 56.0 | 6.3 |
| R16521 | R98026/I11207 | 10 | 22.8 | 44.6 | 45.0 | 106 | 1.0 | 53.0 | 3.7 |
| R16519 | S12909/I13423 | 29 | 22.7 | 33.6 | 44.0 | 104 | 1.0 | 51.3 | 4.3 |
| R98026 | R94037/R94161, **MERLOT** | 4 | 22.6 | 40.8 | 44.0 | 104 | 1.3 | 53.7 | 4.0 |
| R16522 | R98026/I11207 | 40 | 22.5 | 42.9 | 45.0 | 106 | 1.0 | 55.3 | 4.3 |
| R16509 | R12840/R12828 | 19 | 22.5 | 32.5 | 44.0 | 106 | 1.0 | 51.7 | 3.7 |
| S16807 | S08418/S12909 | 37 | 22.2 | 36.4 | 45.0 | 102 | 1.0 | 54.3 | 5.0 |
| S16804 | S08418/S12904 | 34 | 21.8 | 37.4 | 44.0 | 102 | 1.0 | 55.7 | 4.7 |
| S16809 | S12906/R11614 | 39 | 21.2 | 37.3 | 45.0 | 104 | 1.0 | 53.3 | 5.0 |
| R16514 | R12859/S12904 | 24 | 21.2 | 39.4 | 48.0 | 106 | 1.0 | 55.0 | 4.7 |
| S16801 | R12859/S12904 | 31 | 20.9 | 33.9 | 43.0 | 100 | 1.0 | 53.0 | 4.0 |
| R16516 | R11614/I10126 | 26 | 20.0 | 28.5 | 44.0 | 100 | 1.0 | 52.0 | 4.7 |
| R16501 | R12828/R12859 | 11 | 19.6 | 30.9 | 44.0 | 97 | 1.0 | 50.0 | 4.7 |
| R16510 | R13517/R12828 | 20 | 19.6 | 30.2 | 45.0 | 105 | 1.0 | 53.0 | 4.0 |
| R16517 | R11610/I10126 | 27 | 19.3 | 29.0 | 43.0 | 97 | 1.0 | 49.0 | 4.0 |
| R16515 | R12859/S12904 | 25 | 19.2 | 34.0 | 44.0 | 108 | 1.0 | 55.0 | 4.0 |
| S16803 | S12906/R13423 | 33 | 19.1 | 31.6 | 43.0 | 101 | 1.0 | 51.0 | 4.0 |
| S14706 | Rosetta/S11707 | 7 | 19.0 | 43.6 | 45.0 | 108 | 1.3 | 50.0 | 3.7 |
| R11806 | X07714/X07710, **GYPSY ROSE** | 9 | 19.0 | 34.6 | 49.0 | 107 | 2.0 | 47.0 | 4.0 |
| R11801 | X07712/X07721, **DESERT SONG** | 8 | 18.9 | 34.0 | 43.0 | 97 | 2.0 | 47.7 | 4.0 |
| R13752 | Merlot/SER48 | 3 | 18.8 | 41.2 | 45.0 | 106 | 1.0 | 55.7 | 4.0 |
| S08418 | S02754/S04503, **ROSETTA** | 6 | 18.8 | 40.0 | 48.0 | 104 | 1.0 | 54.3 | 5.0 |
| R16508 | BC037/R12859 | 18 | 18.6 | 32.3 | 43.0 | 99 | 1.3 | 50.0 | 3.7 |
| R16504 | R12859/R13506 | 14 | 18.6 | 40.9 | 50.0 | 107 | 1.0 | 62.3 | 4.0 |
| R16506 | BC037/R12859 | 16 | 18.3 | 31.2 | 45.0 | 105 | 1.0 | 53.7 | 4.3 |
| R16511 | R13517/R12828 | 21 | 17.2 | 31.9 | 45.0 | 106 | 1.0 | 54.0 | 4.0 |
| R16507 | BC037/R12859 | 17 | 16.6 | 34.0 | 49.0 | 107 | 1.0 | 56.0 | 4.3 |
| S16805 | I12309/S08418 | 35 | 15.1 | 38.5 | 45.0 | 107 | 1.0 | 57.0 | 4.3 |
| S16806 | I12309/S08418 | 36 | 15.0 | 37.4 | 46.0 | 106 | 1.0 | 55.3 | 4.7 |
| R16502 | R12828/R12859 | 12 | 13.4 | 35.5 | 44.0 | 108 | 1.0 | 52.0 | 3.3 |
| R16520 | S12909/BC037 | 30 | 13.4 | 29.0 | 44.0 | 106 | 1.0 | 50.0 | 3.7 |
| R16505 | R13825/R12859 | 15 | 13.3 | 35.5 | 45.0 | 110 | 1.0 | 55.7 | 4.0 |
| S16802 | BC037/S12906 | 32 | 12.0 | 27.5 | 44.0 | 103 | 1.0 | 49.7 | 3.7 |
| R16513 | R13506/R12859 | 23 | 7.8 | 39.5 | 47.0 | 108 | 1.0 | 54.3 | 4.0 |
| MEAN (40) | | | 19.5 | 35.5 | 45.0 | 104.1 | 1.1 | 53.0 | 4.2 |
| LSD (.05) | | | 3.1 | 1.4 | 1.8 | 2.4 | 0.1 | 1.8 | 0.6 |
| CV (%) | | | 11.7 | 3.0 | 2.4 | 1.7 | 5.0 | 2.4 | 11.1 |

**EXPERIMENT 6106 MRPN/CDBN YIELD TRIAL** **PLANTED: 6/3/16**

| NAME | PEDIGREE | ENTRY | YIELD CWT /ACRE | 100 SEED WT. (g) | DAYS TO FLOWER | DAYS TO MATURITY | LODGING (1-5) | HEIGHT (cm) | DES. SCORE |
|---|---|---|---|---|---|---|---|---|---|
| G12901 | G07321/Fuji, **SAMURAI** | 26 | 32.9 | 28.9 | 47.0 | 108 | 2.0 | 52.0 | 4.0 |
| I13401 | SR 09303, **VIPER** | 34 | 32.6 | 36.0 | 48.0 | 107 | 2.0 | 51.7 | 4.0 |
| I15633 | PT 9-5-6 | 19 | 29.7 | 41.2 | 45.0 | 102 | 1.7 | 51.3 | 5.0 |
| I16707 | ND121315 | 11 | 28.7 | 42.0 | 44.0 | 101 | 1.0 | 53.3 | 4.3 |
| G14505 | G11429/P08175 | 3 | 27.5 | 27.5 | 44.0 | 105 | 1.0 | 56.0 | 5.0 |
| R12844 | SR9-5/R09508 | 32 | 27.5 | 41.7 | 45.0 | 105 | 1.7 | 55.3 | 4.7 |
| I14509 | PT11-13 | 20 | 26.2 | 44.3 | 43.0 | 106 | 1.7 | 54.3 | 4.0 |
| I15650 | CO 25069-2 | 5 | 25.9 | 42.9 | 42.0 | 99 | 1.0 | 54.0 | 4.0 |
| R98026 | R94037/R94161, **MERLOT** | 35 | 25.7 | 41.2 | 45.0 | 103 | 1.7 | 53.7 | 4.0 |
| I16705 | ND121448 | 9 | 25.5 | 41.2 | 46.0 | 105 | 1.3 | 57.0 | 5.7 |
| I07113 | PNE-6-94-75/Kodiak, **LAPAZ** | 27 | 24.9 | 45.7 | 47.0 | 104 | 2.0 | 53.0 | 4.0 |
| G13444 | G07302//G08274/P08410 | 2 | 24.4 | 40.1 | 42.0 | 103 | 1.0 | 53.0 | 5.0 |
| I16702 | CO 14330-10 | 4 | 23.5 | 45.6 | 45.0 | 107 | 2.0 | 53.0 | 3.7 |
| I16721 | NE2-15-5 | 14 | 23.2 | 51.0 | 43.0 | 108 | 2.3 | 50.3 | 3.0 |
| P14815 | P11522/LONG'S PEAK | 1 | 22.5 | 43.1 | 45.0 | 102 | 1.0 | 55.3 | 5.7 |
| R13752 | Merlot/SER48 | 33 | 21.8 | 43.9 | 45.0 | 106 | 1.0 | 56.3 | 4.0 |
| P07863 | AN-37/P02630, **ELDORADO** | 36 | 20.8 | 44.0 | 46.0 | 109 | 2.0 | 54.0 | 4.0 |
| I15647 | CO 14790-3 | 23 | 20.7 | 44.3 | 47.0 | 110 | 2.0 | 51.7 | 3.7 |
| I16711 | ACUG 13-SR1 | 31 | 19.4 | 26.3 | 48.0 | 103 | 2.0 | 51.7 | 5.0 |
| I15644 | COSD-35 | 22 | 19.3 | 43.6 | 45.0 | 110 | 2.0 | 52.7 | 3.3 |
| G93414 | **MATTERHORN** | 18 | 18.9 | 37.4 | 42.0 | 97 | 1.7 | 49.0 | 4.0 |
| I15652 | ND121630 | 6 | 18.6 | 46.0 | 45.0 | 111 | 1.7 | 54.3 | 3.0 |
| I16706 | ND121479 | 10 | 18.4 | 45.7 | 49.0 | 108 | 1.3 | 56.0 | 3.7 |
| I16719 | NE1-15-11 | 12 | 18.1 | 38.2 | 42.0 | 107 | 1.7 | 48.0 | 3.0 |
| I99117 | **BUSTER** | 16 | 17.9 | 37.4 | 42.0 | 97 | 2.0 | 46.7 | 2.7 |
| I98313 | CO51715, **MONTROSE** | 17 | 17.7 | 40.3 | 42.0 | 95 | 3.3 | 35.0 | 1.7 |
| I16710 | NE12-15-161 | 25 | 17.5 | 45.4 | 42.0 | 106 | 2.3 | 47.7 | 3.0 |
| I16722 | NE2-15-19 | 15 | 17.0 | 44.6 | 41.0 | 98 | 2.0 | 50.0 | 3.0 |
| I16720 | NE1-15-28 | 13 | 16.8 | 41.0 | 43.0 | 111 | 2.3 | 51.7 | 3.0 |
| I84002 | NW410//VICTOR/AURORA, **OTHELLO** | 28 | 15.6 | 38.8 | 39.0 | 95 | 2.3 | 46.3 | 2.3 |
| I15642 | COSD-7 | 21 | 14.6 | 41.3 | 43.0 | 110 | 2.0 | 51.7 | 3.7 |
| I13450 | CO 91212-4, **CENTENNIAL** | 24 | 12.4 | 40.6 | 43.0 | 110 | 2.0 | 53.3 | 3.0 |
| I16701 | RM 75P | 30 | 12.3 | 33.7 | 40.0 | 95 | 1.0 | 45.7 | 2.7 |
| I14520 | Santa Fe/PS08-108, SF103-8, **PALOMINO** | 29 | 11.9 | 37.9 | 43.0 | 110 | 2.0 | 51.7 | 3.0 |
| I16703 | ND121660 | 7 | 10.2 | 43.3 | 44.0 | 111 | 2.0 | 52.0 | 3.0 |
| I16704 | ND112843 | 8 | 9.2 | 38.8 | 43.0 | 112 | 2.7 | 47.3 | 2.7 |
| MEAN (36) | | | 20.8 | 40.7 | 43.8 | 105.0 | 1.8 | 51.6 | 3.7 |
| LSD (.05) | | | 3.1 | 1.8 | 2.3 | 2.2 | 0.5 | 2.1 | 0.6 |
| CV (%) | | | 11.0 | 3.3 | 3.1 | 1.6 | 21.1 | 3.0 | 12.3 |

**EXPERIMENT 6107 DRYBEAN DROUGHT NURSERY YIELD TRIAL** **PLANTED: 6/3/16**

| NAME | PEDIGREE | ENTRY | YIELD CWT /ACRE | 100 SEED WT. (g) | DAYS TO FLOWER | DAYS TO MATURITY | LODGING (1-5) | HEIGHT (cm) | DES. SCORE |
|---|---|---|---|---|---|---|---|---|---|
| B14302 | B09197/B11334 | 11 | 31.1 | 22.8 | 49.0 | 99 | 1.7 | 55.0 | 6.0 |
| B10244 | B04644/ZORRO, **ZENITH** | 14 | 31.0 | 28.2 | 48.0 | 106 | 2.0 | 51.7 | 4.0 |
| I16713 | B07554/TARS09-RR16, SB2_328 | 5 | 29.4 | 25.7 | 48.0 | 105 | 2.0 | 52.7 | 4.0 |
| I15633 | PT 9-5-6 | 19 | 28.4 | 38.6 | 44.0 | 101 | 2.0 | 51.3 | 4.7 |
| B14311 | B11338/B10241 | 13 | 27.1 | 22.4 | 49.0 | 103 | 1.0 | 53.3 | 4.7 |
| B14303 | B09197/B11334 | 12 | 26.8 | 22.6 | 49.0 | 103 | 1.3 | 56.3 | 5.7 |
| R13752 | Merlot/SER48 | 10 | 26.5 | 43.5 | 43.0 | 106 | 1.3 | 55.3 | 4.3 |
| I05834 | ND020351, **STAMPEDE** | 27 | 25.6 | 44.9 | 42.0 | 107 | 2.0 | 52.0 | 3.7 |
| P07863 | AN-37/P02630, **ELDORADO** | 30 | 25.5 | 43.6 | 44.0 | 109 | 2.0 | 54.7 | 4.0 |
| R12844 | SR9-5/R09508 | 28 | 25.4 | 42.6 | 46.0 | 107 | 1.3 | 55.3 | 4.7 |
| R98026 | R94037/R94161, **MERLOT** | 26 | 24.8 | 41.7 | 42.0 | 107 | 1.3 | 55.0 | 4.0 |
| I14509 | PT11-13 | 20 | 24.5 | 42.5 | 43.0 | 106 | 2.0 | 53.3 | 4.0 |
| I16717 | P00646/TARS PT03-1//CBB-5/456-4, SB2_259_0 | 9 | 24.5 | 32.1 | 41.0 | 95 | 1.0 | 48.0 | 3.3 |
| I14546 | (USPT-ANT)x('Matterhornx98078-5-1-5-1) | 1 | 23.9 | 42.3 | 40.0 | 102 | 1.0 | 49.0 | 3.0 |
| I14548 | Merlotx(MerlotxSER 16) | 2 | 22.9 | 39.2 | 42.0 | 105 | 2.3 | 49.7 | 3.0 |
| P14815 | P11522/LONG'S PEAK | 29 | 22.8 | 45.0 | 46.0 | 103 | 1.0 | 55.0 | 5.3 |
| I16714 | ABC USPT-CBB-5/Stampede, SB2_143 | 6 | 22.4 | 34.9 | 40.0 | 100 | 1.7 | 51.7 | 3.7 |
| I06251 | CO23704,**CROISSANT** | 22 | 20.8 | 38.0 | 42.0 | 108 | 2.7 | 49.0 | 3.0 |
| BC205 | NE2-09-4 | 18 | 19.7 | 43.6 | 43.0 | 97 | 1.7 | 47.3 | 3.0 |
| I14553 | Merlotx(05F-5055-1x98020-3-1-6-2) | 3 | 19.3 | 35.3 | 43.0 | 102 | 1.3 | 51.3 | 3.7 |
| I16712 | Matterhorn/EMP509, SB2_20_1 | 4 | 18.8 | 34.1 | 45.0 | 98 | 2.7 | 48.3 | 2.7 |
| G93414 | **MATTERHORN** | 24 | 18.1 | 37.5 | 41.0 | 98 | 1.3 | 49.0 | 3.7 |
| I16716 | SB2_171, MATT/G21212///MATT/DOR364//USPT-ANT1/H405-8-1-1 | 8 | 17.1 | 28.3 | 43.0 | 105 | 3.0 | 47.0 | 3.0 |
| I13450 | CO 91212-4, **CENTENNIAL** | 21 | 16.6 | 41.4 | 41.0 | 110 | 2.0 | 51.7 | 3.0 |
| BC201 | NE1-09-20 | 16 | 16.6 | 41.4 | 43.0 | 110 | 2.0 | 52.3 | 3.0 |
| I16715 | Matterhorn/EMP84, SB2_105 | 7 | 16.1 | 28.7 | 43.0 | 101 | 2.0 | 50.0 | 3.3 |
| I16718 | CO 46348 | 23 | 15.2 | 35.0 | 40.0 | 95 | 3.7 | 41.0 | 2.3 |
| BC202 | NE1-09-22 | 17 | 10.5 | 46.4 | 44.0 | 110 | 2.7 | 50.3 | 3.0 |
| BC200 | NE1-09-19 | 15 | 7.3 | 38.8 | 41.0 | 112 | 3.3 | 46.3 | 2.7 |
| BC138 | **MARQUIS** | 25 | 6.9 | 38.2 | 41.0 | 110 | 4.3 | 41.3 | 2.0 |
| MEAN (30 | | | 21.5 | 36.6 | 43.4 | 104.0 | 2.0 | 50.8 | 3.7 |
| LSD (.05) | | | 3.1 | 1.8 | 1.6 | 2.7 | 0.6 | 2.2 | 0.7 |
| CV (%) | | | 10.5 | 3.6 | 2.2 | 1.9 | 21.0 | 3.2 | 13.8 |

**EXPERIMENT 6208 STANDARD KIDNEY YIELD TRIAL** **PLANTED: 6/13/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| I15620 | DRK 07323, **CHAPARRAL** | 6 | 40.0 | 51.5 | 37.0 | 100 | 2.0 | 47.5 | 3.8 | 2.0 |
| K15304 | K11306/K11916 | 7 | 39.4 | 55.1 | 37.0 | 100 | 1.0 | 50.5 | 4.8 | 2.0 |
| K15601 | K11306/K11916 | 11 | 39.3 | 54.5 | 36.0 | 101 | 1.0 | 51.3 | 4.8 | 1.5 |
| K11306 | K06621/USDK-CBB-15 | 23 | 37.1 | 54.2 | 37.0 | 100 | 1.0 | 49.0 | 5.0 | 1.8 |
| I92014 | **ETNA** | 10 | 35.3 | 65.0 | 35.0 | 95 | 1.0 | 45.8 | 3.5 | 3.0 |
| C13413 | C07411/C08712 | 21 | 35.1 | 54.6 | 35.0 | 95 | 1.0 | 46.0 | 4.5 | 3.5 |
| K15901 | K11714/K11914 | 13 | 34.6 | 64.3 | 35.0 | 97 | 1.0 | 48.0 | 4.3 | 3.3 |
| K90101 | CHAR/2*MONT, **RED HAWK** | 15 | 34.3 | 61.1 | 38.0 | 99 | 1.3 | 48.3 | 3.8 | 2.8 |
| I13421 | ND061106, **ROSIE** | 1 | 34.1 | 54.3 | 37.0 | 101 | 1.5 | 51.0 | 4.5 | 2.5 |
| I13420 | ND061210, **TALON** | 14 | 33.9 | 55.4 | 37.0 | 99 | 2.0 | 48.8 | 3.8 | 3.0 |
| K08961 | K04604/USDK-CBB-15, **SNOWDON** | 20 | 33.9 | 69.5 | 35.0 | 96 | 1.0 | 47.8 | 4.5 | 2.8 |
| C13414 | C08714/BELLAGIO | 19 | 33.0 | 58.5 | 35.0 | 94 | 1.3 | 46.5 | 4.8 | 3.3 |
| K15302 | K11303/K11308 | 5 | 32.8 | 52.3 | 36.0 | 98 | 1.0 | 48.5 | 4.5 | 3.0 |
| I13422 | ACUG 10-W1, **YETI** | 8 | 32.4 | 57.1 | 37.0 | 102 | 1.3 | 50.5 | 3.8 | 2.8 |
| K15303 | K11303/K11308 | 4 | 32.3 | 51.6 | 36.0 | 98 | 1.0 | 50.5 | 4.8 | 3.0 |
| K74002 | MDRK/CN(3)-HBR(NEB#1), **MONTCALM** | 18 | 32.0 | 56.9 | 38.0 | 103 | 1.8 | 50.0 | 3.3 | 3.5 |
| I11201 | Pink Panther//ZAA/Montcalm, **CLOUSEAU** | 9 | 31.0 | 65.2 | 35.0 | 97 | 1.8 | 49.5 | 3.0 | 4.0 |
| I15622 | **DYNASTY** | 2 | 30.8 | 63.3 | 36.0 | 100 | 2.0 | 50.5 | 3.8 | 3.8 |
| I90013 | **CELRK** | 17 | 29.2 | 63.4 | 35.0 | 94 | 1.0 | 44.0 | 3.5 | 4.5 |
| K90902 | BEA/50B1807//LASSEN, **BELUGA** | 3 | 28.1 | 63.1 | 37.0 | 102 | 1.3 | 51.3 | 4.0 | 3.3 |
| K15906 | K08961/K12811 | 16 | 27.3 | 68.0 | 34.0 | 96 | 1.0 | 48.0 | 4.5 | 3.5 |
| K01234 | Mutant of Red Hawk, **REDCOAT** | 24 | 27.3 | 62.2 | 35.0 | 98 | 1.0 | 47.8 | 4.0 | 3.0 |
| I15619 | LRK 09351, **BIG RED** | 12 | 27.2 | 61.4 | 35.0 | 95 | 1.0 | 48.0 | 4.0 | 3.8 |
| K14807 | Snowdon/Isabella | 22 | 22.9 | 57.2 | 35.0 | 93 | 1.3 | 47.3 | 5.0 | 3.0 |
| MEAN (24) | | | 32.6 | 59.1 | 35.8 | 97.8 | 1.3 | 48.6 | 4.2 | 3.0 |
| LSD (.05) | | | 4.6 | 2.4 | 2.1 | 2.1 | 0.3 | 1.7 | 0.5 | 0.8 |
| CV (%) | | | 11.8 | 3.4 | 3.4 | 1.8 | 22.7 | 3.0 | 10.1 | 22.0 |

**EXPERIMENT 6209 PRELIMINARY DARK RED KIDNEY YIELD TRIAL** **PLANTED: 6/10/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| K16136 | K12206/I07151 | 36 | 43.9 | 53.9 | 38.0 | 101 | 1.0 | 49.5 | 5.0 | 2.3 |
| K16117 | K74002/K12225 | 17 | 43.7 | 50.4 | 40.0 | 101 | 1.5 | 49.5 | 4.5 | 2.0 |
| K16135 | K12206/I07151 | 35 | 42.7 | 59.0 | 38.0 | 101 | 1.0 | 49.5 | 5.0 | 2.0 |
| K16119 | K08961/K12602 | 19 | 42.7 | 51.7 | 40.0 | 102 | 1.0 | 50.5 | 4.5 | 2.0 |
| K16107 | K12203/K11320 | 7 | 42.4 | 48.0 | 43.0 | 98 | 1.5 | 50.5 | 5.0 | 2.0 |
| K16126 | K11320/I07151 | 26 | 42.1 | 49.1 | 42.0 | 103 | 1.0 | 50.5 | 4.0 | 2.3 |
| K16109 | K12205/K11320 | 9 | 41.3 | 54.8 | 42.0 | 101 | 1.0 | 50.0 | 5.0 | 1.7 |
| K16101 | K08961/K11919 | 1 | 41.1 | 56.1 | 42.0 | 103 | 1.0 | 52.5 | 4.5 | 2.0 |
| K16121 | K08961/K12602 | 21 | 40.5 | 50.8 | 40.0 | 100 | 1.0 | 49.5 | 5.5 | 1.7 |
| K16134 | K12206/I07151 | 34 | 40.5 | 56.6 | 38.0 | 101 | 1.0 | 49.5 | 4.5 | 2.0 |
| K16104 | K11917/K12219 | 4 | 40.0 | 56.8 | 36.0 | 95 | 1.0 | 47.0 | 4.5 | 2.0 |
| K16148 | K11306/I13464 | 48 | 39.9 | 51.8 | 38.0 | 101 | 1.0 | 50.5 | 5.0 | 2.3 |
| K16128 | K11320/I07151 | 28 | 39.7 | 49.2 | 40.0 | 102 | 1.0 | 50.0 | 4.5 | 2.0 |
| K16131 | K11914/K12209 | 31 | 39.1 | 66.5 | 40.0 | 102 | 1.0 | 51.5 | 4.5 | 2.3 |
| K16153 | K12803/K12811 | 53 | 38.9 | 53.4 | 43.0 | 105 | 1.0 | 54.0 | 3.0 | 1.7 |
| K16110 | K12205/K11320 | 10 | 38.5 | 53.5 | 42.0 | 101 | 1.0 | 51.5 | 5.0 | 1.7 |
| K16147 | K11306/I13464 | 47 | 38.2 | 51.6 | 40.0 | 100 | 1.0 | 50.5 | 5.0 | 2.0 |
| I13421 | ND061106, **ROSIE** | 79 | 37.9 | 55.0 | 39.0 | 102 | 1.5 | 50.5 | 4.0 | 3.0 |
| K16137 | K12225/K11303 | 37 | 37.8 | 53.9 | 42.0 | 101 | 1.0 | 51.0 | 5.0 | 3.0 |
| K16106 | K12203/K11320 | 6 | 37.7 | 41.4 | 47.0 | 96 | 1.0 | 51.0 | 4.5 | 1.3 |
| K16146 | K11306/I13464 | 46 | 37.3 | 53.3 | 38.0 | 99 | 1.0 | 49.5 | 5.0 | 2.7 |
| K16120 | K08961/K12602 | 20 | 36.7 | 49.2 | 39.0 | 100 | 1.0 | 49.0 | 5.0 | 1.7 |
| K16149 | K12206/K08961 | 49 | 35.8 | 53.7 | 43.0 | 96 | 1.0 | 51.0 | 5.0 | 3.0 |
| K16152 | K13902/K12206 | 52 | 35.6 | 50.3 | 46.0 | 105 | 1.0 | 54.0 | 3.0 | 2.0 |
| K16108 | K12203/K11320 | 8 | 35.3 | 43.5 | 46.0 | 96 | 1.5 | 50.5 | 4.5 | 2.0 |
| K16118 | K74002/K12225 | 18 | 35.3 | 46.3 | 44.0 | 100 | 2.5 | 47.5 | 3.0 | 2.0 |
| K16127 | K11320/I07151 | 27 | 34.4 | 46.2 | 42.0 | 101 | 1.0 | 51.0 | 5.0 | 3.0 |
| K16125 | K77002/K12209 | 25 | 34.2 | 48.9 | 45.0 | 99 | 1.0 | 54.5 | 4.5 | 3.7 |
| K16130 | K11320/I07151 | 30 | 34.2 | 49.1 | 42.0 | 98 | 1.0 | 50.0 | 5.0 | 3.0 |
| K16102 | K11320/K12219 | 2 | 34.1 | 51.9 | 41.0 | 100 | 1.5 | 49.5 | 4.5 | 2.3 |
| I15620 | DRK 07323, **CHAPARRAL** | 78 | 33.9 | 52.7 | 38.0 | 98 | 2.0 | 48.5 | 3.5 | 3.0 |
| K16123 | K77002/K12209 | 23 | 33.6 | 52.9 | 42.0 | 98 | 1.0 | 53.0 | 4.0 | 3.3 |
| K16129 | K11320/I07151 | 29 | 33.2 | 48.5 | 41.0 | 99 | 1.0 | 52.0 | 5.0 | 3.0 |
| K16133 | K12206/I07151 | 33 | 33.1 | 59.5 | 38.0 | 99 | 1.5 | 49.5 | 5.0 | 3.3 |
| K16122 | K77002/K12209 | 22 | 33.0 | 55.4 | 40.0 | 96 | 1.0 | 49.5 | 4.5 | 3.7 |

**EXPERIMENT 6209 PRELIMINARY DARK RED KIDNEY YIELD TRIAL** **PLANTED: 6/10/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| K16111 | K12206/K11320 | 11 | 32.8 | 56.0 | 37.0 | 104 | 1.0 | 49.0 | 4.0 | 2.0 |
| K16112 | I13463/K12219 | 12 | 32.3 | 47.6 | 39.0 | 104 | 1.0 | 53.0 | 3.5 | 2.7 |
| I13420 | ND061210, **TALON** | 77 | 32.1 | 52.7 | 41.0 | 97 | 2.0 | 48.0 | 3.5 | 3.0 |
| K16141 | I07151/K12219 | 41 | 31.9 | 54.8 | 38.0 | 98 | 1.0 | 50.5 | 5.0 | 3.0 |
| K16115 | I13463/K12219 | 15 | 31.6 | 50.8 | 39.0 | 100 | 1.0 | 50.5 | 4.5 | 2.7 |
| K16166 | K13302/K12214 | 66 | 31.6 | 55.0 | 38.0 | 100 | 1.5 | 49.5 | 4.5 | 3.0 |
| K16124 | K77002/K12209 | 24 | 31.3 | 46.8 | 42.0 | 94 | 1.0 | 52.0 | 3.5 | 3.7 |
| K16114 | I13463/K12219 | 14 | 31.2 | 54.3 | 39.0 | 102 | 1.0 | 49.5 | 4.5 | 2.7 |
| K16165 | K13302/K12214 | 65 | 30.8 | 58.4 | 38.0 | 97 | 1.0 | 49.0 | 5.0 | 3.7 |
| K16143 | I07151/K12219 | 43 | 30.7 | 58.3 | 38.0 | 97 | 1.0 | 47.0 | 4.0 | 4.0 |
| K16145 | K11320/I13462 | 45 | 30.7 | 56.4 | 37.0 | 96 | 1.0 | 46.5 | 4.5 | 3.7 |
| K16132 | K12206/I07151 | 32 | 30.7 | 55.6 | 40.0 | 97 | 1.0 | 49.5 | 5.0 | 3.0 |
| K16168 | K13302/K12214 | 68 | 30.6 | 55.1 | 38.0 | 98 | 1.0 | 50.0 | 5.0 | 3.0 |
| K16169 | K13302/K12214 | 69 | 29.8 | 56.0 | 38.0 | 96 | 1.0 | 48.0 | 4.5 | 3.3 |
| K16150 | K74002/I93127 | 50 | 29.6 | 52.9 | 38.0 | 97 | 1.0 | 48.5 | 4.5 | 3.7 |
| K90101 | CHAR/2*MONT, **RED HAWK** | 75 | 29.5 | 52.2 | 37.0 | 97 | 1.0 | 48.5 | 5.0 | 3.7 |
| K08961 | K04604/USDK-CBB-15, **SNOWDON** | 80 | 29.5 | 62.9 | 37.0 | 93 | 1.0 | 48.0 | 5.0 | 4.0 |
| K16167 | K13302/K12214 | 67 | 29.5 | 55.5 | 38.0 | 96 | 1.0 | 47.5 | 4.0 | 3.3 |
| K74002 | MDRK/CN(3)-HBR, **MONTCALM** | 76 | 29.4 | 54.4 | 38.0 | 100 | 2.0 | 48.5 | 4.0 | 3.3 |
| K16140 | I06214/K12214 | 40 | 29.3 | 54.4 | 40.0 | 100 | 1.0 | 51.0 | 5.0 | 3.7 |
| K16144 | I07151/K12219 | 44 | 29.2 | 54.2 | 38.0 | 95 | 1.0 | 48.5 | 4.5 | 3.7 |
| K16103 | K11320/K12219 | 3 | 29.1 | 48.2 | 41.0 | 97 | 1.5 | 49.0 | 4.5 | 3.3 |
| K16142 | I07151/K12219 | 42 | 29.0 | 49.5 | 38.0 | 94 | 1.0 | 46.5 | 3.5 | 3.3 |
| K16116 | I13463/K12219 | 16 | 28.4 | 50.3 | 39.0 | 96 | 1.0 | 50.5 | 4.5 | 3.0 |
| K16170 | K13302/K12214 | 70 | 28.0 | 56.6 | 39.0 | 97 | 1.0 | 48.0 | 4.5 | 3.0 |
| K16113 | I13463/K12219 | 13 | 27.9 | 44.9 | 38.0 | 100 | 2.0 | 49.5 | 3.5 | 3.0 |
| K16163 | K13302/K12214 | 63 | 27.9 | 55.2 | 38.0 | 96 | 1.0 | 48.5 | 4.5 | 3.3 |
| K16151 | K74002/I93127 | 51 | 27.8 | 53.2 | 39.0 | 95 | 1.0 | 47.0 | 4.0 | 4.0 |
| K16157 | I06214/K11320 | 57 | 27.8 | 48.5 | 38.0 | 99 | 1.5 | 51.0 | 4.0 | 3.3 |
| K16160 | K12601/I10135 | 60 | 27.3 | 53.9 | 39.0 | 97 | 1.0 | 47.0 | 4.5 | 3.3 |
| K16138 | I06214/K12214 | 38 | 27.1 | 55.2 | 39.0 | 102 | 1.0 | 51.5 | 3.5 | 3.0 |
| K16162 | K13302/K12214 | 62 | 26.7 | 52.2 | 38.0 | 95 | 1.0 | 48.0 | 4.5 | 3.3 |
| K16172 | K13302/K12214 | 72 | 26.4 | 59.5 | 37.0 | 95 | 1.0 | 46.5 | 4.5 | 3.3 |
| K16139 | I06214/K12214 | 39 | 26.4 | 57.5 | 41.0 | 101 | 1.0 | 53.0 | 3.5 | 3.0 |
| K16173 | K13302/K12214 | 73 | 26.1 | 56.7 | 38.0 | 96 | 1.0 | 47.5 | 4.0 | 3.7 |

**EXPERIMENT 6209 PRELIMINARY DARK RED KIDNEY YIELD TRIAL** **PLANTED: 6/10/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| K16154 | K12803/K12811 | 54 | 25.9 | 55.0 | 37.0 | 98 | 1.0 | 51.5 | 3.5 | 3.7 |
| K16164 | K13302/K12214 | 64 | 25.7 | 50.8 | 38.0 | 95 | 1.0 | 48.5 | 4.0 | 3.3 |
| K16161 | K13302/K12214 | 61 | 25.7 | 51.2 | 38.0 | 98 | 1.0 | 49.0 | 5.0 | 3.7 |
| K16156 | I06214/K11320 | 56 | 25.4 | 50.2 | 48.0 | 101 | 1.0 | 52.0 | 4.0 | 2.7 |
| K16159 | I13464/K77002 | 59 | 24.0 | 46.0 | 38.0 | 104 | 1.0 | 53.5 | 3.5 | 3.0 |
| K16155 | I06214/K11320 | 55 | 23.4 | 52.1 | 38.0 | 100 | 1.0 | 50.0 | 4.0 | 3.0 |
| K16171 | K13302/K12214 | 71 | 21.9 | 52.1 | 37.0 | 94 | 1.0 | 46.5 | 4.5 | 4.3 |
| K16105 | K11917/K12219 | 5 | 21.8 | 52.6 | 36.0 | 94 | 1.0 | 45.0 | 3.5 | 5.0 |
| K16174 | I13464/K74002 | 74 | 16.6 | 55.2 | 49.0 | 106 | 1.0 | 54.0 | 3.0 | 2.7 |
| K16158 | I13463/K12214 | 58 | 15.5 | 40.2 | 45.0 | 104 | 1.0 | 53.5 | 3.0 | 3.0 |
| MEAN (80) | | | 32.3 | 52.7 | 39.6 | 98.6 | 1.1 | 49.8 | 4.3 | 2.9 |
| LSD (.05) | | | 3.2 | 1.2 | 0.6 | 1.0 | 0.3 | 1.4 | 0.7 | 0.5 |
| CV (%) | | | 7.4 | 1.4 | 0.9 | 0.6 | 18.4 | 1.6 | 9.7 | 13.2 |

**EXPERIMENT 6210 PRELIMINARY LIGHT RED KIDNEY YIELD TRIAL** **PLANTED: 6/10/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| K16640 | K11914/K12209 | 40 | 46.4 | 61.4 | 40.0 | 103 | 1.5 | 50.5 | 3.5 | 2.0 |
| K16647 | K13902/K12206 | 47 | 40.3 | 58.6 | 42.0 | 103 | 1.0 | 50.5 | 4.0 | 2.0 |
| K16657 | K13603/H9659-21-1 | 57 | 39.6 | 56.8 | 38.0 | 98 | 1.0 | 46.0 | 4.0 | 3.0 |
| K16656 | K13603/H9659-21-1 | 56 | 39.5 | 56.2 | 38.0 | 98 | 1.0 | 49.0 | 4.5 | 3.3 |
| K16655 | K11713/K13902 | 55 | 39.2 | 62.4 | 37.0 | 95 | 1.0 | 45.0 | 4.5 | 2.3 |
| K16652 | K11713/K13902 | 52 | 38.5 | 60.1 | 37.0 | 95 | 1.0 | 46.0 | 4.5 | 2.7 |
| K16646 | K13902/K12206 | 46 | 38.1 | 57.9 | 46.0 | 105 | 1.0 | 49.5 | 3.5 | 2.0 |
| K16638 | K11714/K12811 | 38 | 37.6 | 59.7 | 37.0 | 95 | 1.0 | 45.0 | 4.5 | 2.0 |
| I13421 | ND061106, **ROSIE** | 64 | 37.4 | 53.4 | 40.0 | 100 | 1.5 | 49.0 | 4.5 | 3.0 |
| K16607 | K11709/K13602 | 7 | 37.1 | 54.9 | 40.0 | 99 | 1.0 | 49.0 | 4.0 | 3.0 |
| K16613 | K11714/Isabella | 13 | 36.8 | 55.3 | 40.0 | 97 | 1.0 | 47.0 | 4.0 | 3.7 |
| K16654 | K11713/K13902 | 54 | 36.6 | 59.4 | 37.0 | 96 | 1.0 | 46.5 | 4.5 | 2.3 |
| K16658 | K13603/H9659-21-1 | 58 | 36.3 | 57.5 | 39.0 | 98 | 1.0 | 46.0 | 3.5 | 3.3 |
| K16605 | K11709/K13602 | 5 | 36.3 | 56.9 | 38.0 | 96 | 1.0 | 48.5 | 5.0 | 3.3 |
| K16644 | K12602/K13602 | 44 | 35.9 | 43.8 | 40.0 | 94 | 1.0 | 46.5 | 3.5 | 3.0 |
| K16622 | CBB-15/Snowdon | 22 | 35.3 | 58.8 | 42.0 | 98 | 1.0 | 50.0 | 4.5 | 3.0 |
| K16609 | K11714/Isabella | 9 | 35.2 | 57.3 | 44.0 | 100 | 1.0 | 50.5 | 4.0 | 3.0 |
| K16661 | K13603/H9659-21-1 | 61 | 34.9 | 51.5 | 39.0 | 101 | 1.0 | 50.5 | 4.0 | 3.0 |
| K16623 | CBB-15/Snowdon | 23 | 34.6 | 57.8 | 43.0 | 96 | 1.0 | 50.0 | 4.5 | 3.0 |
| K16624 | CBB-15/Snowdon | 24 | 33.8 | 58.8 | 39.0 | 97 | 1.5 | 48.5 | 4.5 | 3.0 |
| K16643 | K12602/K13602 | 43 | 33.7 | 49.5 | 42.0 | 96 | 1.5 | 47.0 | 3.5 | 3.0 |
| K16639 | K11714/K12811 | 39 | 33.5 | 58.9 | 37.0 | 95 | 1.0 | 46.0 | 5.0 | 2.3 |
| K16637 | K11709/K12601 | 37 | 33.4 | 48.6 | 39.0 | 96 | 1.0 | 48.0 | 5.0 | 3.0 |
| K16649 | K13902/K12206 | 49 | 33.2 | 58.6 | 45.0 | 104 | 1.0 | 51.5 | 3.5 | 1.7 |
| K16606 | K11709/K13602 | 6 | 33.0 | 50.1 | 39.0 | 100 | 1.5 | 48.0 | 4.5 | 3.0 |
| K16659 | K13603/H9659-21-1 | 59 | 32.9 | 54.5 | 38.0 | 96 | 1.0 | 48.5 | 4.5 | 3.3 |
| K16660 | K13603/H9659-21-1 | 60 | 32.8 | 48.2 | 41.0 | 104 | 1.0 | 53.0 | 3.0 | 3.0 |
| K16653 | K11713/K13902 | 53 | 32.6 | 59.9 | 37.0 | 95 | 1.0 | 45.5 | 4.5 | 2.3 |
| K16604 | Isabella/K11714 | 4 | 32.5 | 64.5 | 37.0 | 94 | 1.0 | 48.5 | 4.0 | 4.3 |
| K16619 | K13604/Snowdon | 19 | 32.1 | 55.4 | 37.0 | 95 | 1.5 | 49.0 | 4.0 | 4.0 |
| K16648 | K13902/K12206 | 48 | 31.5 | 59.7 | 47.0 | 104 | 2.0 | 50.5 | 3.0 | 2.0 |
| K16651 | PR1340-8/K77002 | 51 | 31.1 | 48.8 | 47.0 | 104 | 1.0 | 53.0 | 3.0 | 3.0 |
| K16610 | K11714/Isabella | 10 | 31.1 | 57.1 | 46.0 | 101 | 1.5 | 51.5 | 3.5 | 3.3 |
| K16645 | K13902/K12206 | 45 | 31.0 | 61.4 | 49.0 | 105 | 1.5 | 51.5 | 3.0 | 2.0 |
| K16630 | Isabella/K12209 | 30 | 30.3 | 47.7 | 41.0 | 102 | 1.0 | 53.0 | 3.0 | 3.3 |

**EXPERIMENT 6210 PRELIMINARY LIGHT RED KIDNEY YIELD TRIAL** **PLANTED: 6/10/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| K16642 | K11303/Snowdon | 42 | 30.3 | 58.0 | 40.0 | 97 | 1.5 | 49.0 | 4.5 | 3.3 |
| K16632 | Isabella/K12209 | 32 | 30.3 | 48.4 | 44.0 | 99 | 1.0 | 50.5 | 4.0 | 3.7 |
| K16614 | K13604/Snowdon | 14 | 30.1 | 55.9 | 42.0 | 98 | 1.0 | 51.0 | 4.5 | 3.0 |
| K16631 | Isabella/K12209 | 31 | 29.8 | 49.8 | 43.0 | 102 | 1.5 | 51.5 | 3.5 | 3.0 |
| K16636 | K11709/K12601 | 36 | 29.8 | 48.9 | 38.0 | 99 | 1.0 | 47.5 | 5.0 | 3.0 |
| K16633 | Isabella/K12209 | 33 | 29.6 | 49.0 | 46.0 | 100 | 1.0 | 52.5 | 3.0 | 3.3 |
| K16641 | K11303/Snowdon | 41 | 29.6 | 57.6 | 38.0 | 97 | 1.0 | 49.0 | 5.0 | 3.3 |
| K16617 | K13604/Snowdon | 17 | 29.1 | 58.7 | 38.0 | 96 | 1.0 | 49.5 | 4.0 | 4.0 |
| K16634 | Isabella/K12209 | 34 | 28.7 | 47.5 | 43.0 | 98 | 1.5 | 51.5 | 4.0 | 3.7 |
| K16612 | K11714/Isabella | 12 | 28.6 | 56.8 | 44.0 | 97 | 1.5 | 48.5 | 3.0 | 3.3 |
| K16635 | Isabella/K12209 | 35 | 27.7 | 48.2 | 44.0 | 96 | 1.0 | 50.0 | 4.5 | 3.7 |
| K16603 | Isabella/K11714 | 3 | 27.5 | 68.0 | 38.0 | 94 | 1.0 | 47.5 | 3.5 | 4.7 |
| K16629 | Isabella/K12209 | 29 | 27.5 | 48.8 | 45.0 | 101 | 1.0 | 52.5 | 3.5 | 3.7 |
| K16618 | K13604/Snowdon | 18 | 27.2 | 56.3 | 38.0 | 94 | 1.0 | 49.5 | 3.0 | 4.3 |
| K16621 | K13604/Snowdon | 21 | 26.8 | 61.1 | 39.0 | 97 | 1.0 | 51.0 | 4.0 | 3.7 |
| K16620 | K13604/Snowdon | 20 | 26.3 | 58.9 | 43.0 | 98 | 1.0 | 51.5 | 4.5 | 3.7 |
| K16615 | K13604/Snowdon | 15 | 26.3 | 53.0 | 41.0 | 97 | 1.5 | 50.0 | 4.0 | 3.7 |
| K16628 | Isabella/Snowdon | 28 | 26.2 | 56.7 | 38.0 | 94 | 1.0 | 47.5 | 4.0 | 5.0 |
| K16616 | K13604/Snowdon | 16 | 26.0 | 57.0 | 39.0 | 94 | 1.5 | 49.5 | 4.5 | 4.0 |
| K16626 | Isabella/Snowdon | 26 | 25.3 | 58.7 | 38.0 | 95 | 1.0 | 48.0 | 4.0 | 5.0 |
| K16608 | K11714/Isabella | 8 | 25.0 | 63.9 | 37.0 | 94 | 1.0 | 45.0 | 3.5 | 4.0 |
| K16602 | Isabella/K11714 | 2 | 23.5 | 64.4 | 37.0 | 93 | 1.0 | 46.0 | 3.0 | 4.7 |
| K16650 | PR1340-8/K77002 | 50 | 23.1 | 51.4 | 39.0 | 95 | 1.0 | 48.5 | 4.5 | 4.0 |
| I11201 | Pink Panther//ZAA/Montcalm, **CLOUSEAU** | 63 | 22.2 | 61.2 | 38.0 | 94 | 1.0 | 47.0 | 3.0 | 5.0 |
| K16601 | Isabella/K11714 | 1 | 21.7 | 55.8 | 38.0 | 93 | 1.5 | 46.0 | 3.0 | 5.0 |
| K16611 | K11714/Isabella | 11 | 21.4 | 55.6 | 37.0 | 96 | 1.0 | 48.5 | 3.0 | 4.3 |
| K16625 | Isabella/Snowdon | 25 | 20.7 | 56.1 | 37.0 | 93 | 1.0 | 45.0 | 3.0 | 4.7 |
| I90013 | **CELRK** | 62 | 20.2 | 59.4 | 38.0 | 93 | 1.0 | 46.5 | 3.5 | 5.0 |
| K16627 | Isabella/Snowdon | 27 | 19.1 | 58.1 | 37.0 | 93 | 1.0 | 46.0 | 3.5 | 5.0 |
| MEAN (64) | | | 31.1 | 56.0 | 40.0 | 97.3 | 1.1 | 48.8 | 3.9 | 3.4 |
| LSD (.05) | | | 3.8 | 2.5 | 2.2 | 0.6 | 0.4 | 0.9 | 0.7 | 0.2 |
| CV (%) | | | 9.1 | 3.2 | 3.2 | 0.4 | 19.6 | 1.1 | 11.0 | 5.2 |

**EXPERIMENT 6211 PRELIMINARY WHITE KIDNEY YIELD TRIAL** **PLANTED: 6/10/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| K16980 | K13902/I93127 | 80 | 43.1 | 58.4 | 41.0 | 104 | 1.5 | 50.0 | 4.0 | 2.0 |
| K16955 | I05101/K11914 | 55 | 39.7 | 58.8 | 42.0 | 104 | 1.0 | 51.0 | 3.5 | 2.3 |
| K16981 | K13902/I93127 | 81 | 39.2 | 55.4 | 39.0 | 102.0 | 1.0 | 50.5 | 4.5 | 2.3 |
| K16982 | K13902/I93127 | 82 | 38.9 | 51.2 | 40.0 | 102.0 | 1.0 | 49.0 | 4.0 | 2.3 |
| K16962 | K12206/K08961 | 62 | 38.7 | 54.3 | 45.0 | 100 | 1.0 | 49.5 | 5.0 | 3.0 |
| K16958 | K12206/K08961 | 58 | 38.3 | 52.3 | 43.0 | 102 | 2.0 | 50.0 | 3.0 | 2.3 |
| K16954 | I05101/K11914 | 54 | 37.6 | 55.0 | 38.0 | 104 | 1.5 | 50.0 | 3.5 | 2.7 |
| K16941 | K12209/K13907 | 41 | 36.5 | 47.9 | 41.0 | 100 | 1.0 | 49.5 | 5.0 | 2.3 |
| K16933 | I05101/K08961 | 33 | 35.7 | 56.2 | 45.0 | 103 | 1.5 | 50.5 | 4.0 | 2.3 |
| K16973 | K12811/K12601 | 73 | 35.3 | 48.2 | 38.0 | 103 | 1.0 | 49.0 | 3.5 | 2.0 |
| K16942 | K12209/K13907 | 42 | 35.3 | 47.9 | 45.0 | 100 | 1.5 | 50.0 | 4.5 | 3.0 |
| K16959 | K12206/K08961 | 59 | 35.2 | 56.5 | 38.0 | 101 | 1.0 | 49.0 | 4.5 | 3.0 |
| K16924 | K11917/K08961 | 24 | 35.0 | 57.9 | 38.0 | 96.0 | 1.0 | 48.5 | 5.0 | 3.3 |
| K16984 | K12803/K12811 | 84 | 35.0 | 63.1 | 37.0 | 96.0 | 1.0 | 46.5 | 4.5 | 2.0 |
| K16950 | K12219/K08961 | 50 | 34.8 | 51.9 | 41.0 | 102 | 1.5 | 52.5 | 4.0 | 3.0 |
| K16943 | K12209/K13907 | 43 | 34.8 | 49.6 | 40.0 | 99 | 1.5 | 50.0 | 4.5 | 3.7 |
| K16940 | K11714/K12811 | 40 | 34.8 | 56.1 | 38.0 | 94 | 1.0 | 45.0 | 4.0 | 2.0 |
| K16961 | K12206/K08961 | 61 | 34.1 | 57.7 | 44.0 | 103 | 1.0 | 50.5 | 4.5 | 3.0 |
| K16939 | K08961/K12601 | 39 | 34.0 | 58.3 | 40.0 | 102 | 1.5 | 49.5 | 4.0 | 3.3 |
| K16934 | I05101/K08961 | 34 | 33.9 | 59.0 | 41.0 | 96 | 2.0 | 49.0 | 4.5 | 3.0 |
| K16983 | K13902/K12206 | 83 | 33.8 | 56.9 | 40.0 | 104 | 1.5 | 52.0 | 4.0 | 1.7 |
| K16951 | K12219/K08961 | 51 | 33.6 | 59.8 | 41.0 | 103 | 1.0 | 51.5 | 4.0 | 3.0 |
| K16907 | K08961/K11919 | 7 | 33.0 | 57.1 | 38.0 | 94.0 | 1.0 | 45.5 | 4.0 | 3.3 |
| K16985 | K11713/K13902 | 85 | 33.0 | 57.0 | 37.0 | 99.0 | 1.0 | 47.0 | 4.0 | 2.0 |
| K16974 | K12811/K12601 | 74 | 32.9 | 46.5 | 38.0 | 101 | 1.0 | 47.0 | 4.0 | 1.3 |
| K16976 | K12811/K12803 | 76 | 32.6 | 49.4 | 37.0 | 94 | 1.0 | 45.0 | 4.0 | 2.0 |
| K16930 | K13604/K08961 | 30 | 32.5 | 55.9 | 38.0 | 100 | 1.0 | 49.5 | 4.5 | 3.0 |
| K16953 | K12219/K08961 | 53 | 32.5 | 59.7 | 41.0 | 103 | 1.0 | 51.5 | 3.5 | 3.0 |
| K16927 | K13604/K08961 | 27 | 32.5 | 53.3 | 39.0 | 102 | 1.0 | 50.0 | 4.0 | 3.0 |
| K16957 | K12206/K08961 | 57 | 32.5 | 59.6 | 39.0 | 99 | 1.5 | 48.0 | 4.0 | 3.0 |
| K16903 | K77002/K11714 | 3 | 32.3 | 59.5 | 39.0 | 94 | 1.0 | 46.5 | 3.5 | 4.0 |
| K16926 | K13604/K08961 | 26 | 32.1 | 51.3 | 43.0 | 99 | 1.5 | 49.5 | 4.5 | 3.0 |
| K16968 | K11303/K08961 | 68 | 31.9 | 53.6 | 40.0 | 103.0 | 1.0 | 51.0 | 4.0 | 3.3 |
| K16970 | K08961/K11914 | 70 | 31.1 | 60.3 | 38.0 | 94.0 | 1.0 | 47.5 | 5.0 | 4.3 |
| K16978 | K12811/K12803 | 78 | 31.0 | 47.2 | 38.0 | 95 | 1.0 | 45.5 | 4.5 | 1.7 |

**EXPERIMENT 6211 PRELIMINARY WHITE KIDNEY YIELD TRIAL** **PLANTED: 6/10/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| K16914 | K08961/K12214 | 14 | 31.0 | 54.2 | 40.0 | 99 | 1.0 | 50.0 | 4.5 | 3.3 |
| K16906 | K77002/K11714 | 6 | 30.9 | 59.3 | 38.0 | 95 | 1.0 | 47.0 | 5.0 | 4.0 |
| K16975 | K12811/K12803 | 75 | 30.9 | 50.5 | 38.0 | 95 | 1.0 | 44.0 | 4.0 | 2.0 |
| K16931 | K13604/K08961 | 31 | 30.6 | 57.9 | 42.0 | 102 | 1.0 | 51.5 | 3.5 | 3.0 |
| K16929 | K13604/K08961 | 29 | 30.5 | 54.5 | 44.0 | 101 | 2.0 | 51.0 | 4.0 | 3.0 |
| K16960 | K12206/K08961 | 60 | 30.2 | 57.5 | 43.0 | 101 | 2.0 | 49.5 | 4.0 | 3.0 |
| K16967 | K08961/I13465 | 67 | 30.0 | 58.5 | 40.0 | 99 | 1.5 | 49.5 | 4.5 | 3.7 |
| K16911 | K08961/K12214 | 11 | 30.0 | 58.3 | 38.0 | 97.0 | 1.0 | 48.0 | 4.5 | 3.3 |
| K16904 | K77002/K11714 | 4 | 29.8 | 59.1 | 38.0 | 94.0 | 1.5 | 47.0 | 4.0 | 4.0 |
| K16944 | K12209/K13907 | 44 | 29.8 | 43.2 | 42.0 | 98 | 1.5 | 49.0 | 4.0 | 3.3 |
| K16969 | K08961/K11914 | 69 | 29.7 | 61.1 | 37.0 | 94 | 1.0 | 47.0 | 3.5 | 4.3 |
| K16952 | K12219/K08961 | 52 | 29.5 | 51.1 | 38.0 | 95 | 1.0 | 48.0 | 4.5 | 3.3 |
| K16923 | K11917/K08961 | 23 | 29.2 | 61.1 | 37.0 | 95 | 1.0 | 47.0 | 5.0 | 3.7 |
| K16913 | K08961/K12214 | 13 | 29.2 | 55.6 | 41.0 | 101 | 1.0 | 51.5 | 4.5 | 3.3 |
| K16977 | K12811/K12803 | 77 | 29.1 | 47.5 | 37.0 | 95 | 1.0 | 45.0 | 4.0 | 2.0 |
| K16902 | K77002/K11714 | 2 | 29.0 | 60.6 | 38.0 | 94 | 1.5 | 46.5 | 4.0 | 4.0 |
| K16905 | K77002/K11714 | 5 | 29.0 | 63.7 | 38.0 | 94 | 1.0 | 48.0 | 5.0 | 4.0 |
| K90101 | CHAR/2*MONT, **RED HAWK** | 88 | 28.8 | 55.6 | 38.0 | 97.0 | 1.0 | 48.0 | 4.0 | 3.0 |
| K16901 | K77002/K11714 | 1 | 28.5 | 55.6 | 37.0 | 93.0 | 1.0 | 46.5 | 3.5 | 5.0 |
| K16928 | K13604/K08961 | 28 | 28.5 | 54.3 | 42.0 | 99 | 1.5 | 50.0 | 4.0 | 3.0 |
| K16971 | K08961/K11914 | 71 | 28.4 | 61.3 | 37.0 | 94 | 1.0 | 47.0 | 5.0 | 4.0 |
| K16979 | K12811/K12803 | 79 | 27.9 | 50.5 | 38.0 | 94 | 1.0 | 46.0 | 5.0 | 2.0 |
| K16972 | K08961/K11914 | 72 | 27.8 | 61.0 | 37.0 | 94 | 1.0 | 47.5 | 5.0 | 4.0 |
| K16963 | K08961/I13465 | 63 | 27.8 | 61.0 | 38.0 | 94 | 1.5 | 46.0 | 3.0 | 4.3 |
| K16935 | K08961/K12209 | 35 | 27.5 | 50.5 | 40.0 | 95 | 1.0 | 49.0 | 3.5 | 4.0 |
| K08961 | K04604/USDK-CBB-15, **SNOWDON** | 86 | 27.3 | 62.4 | 38.0 | 94 | 1.0 | 46.5 | 4.5 | 4.0 |
| K16909 | K08961/K12214 | 9 | 27.3 | 55.8 | 39.0 | 100 | 1.5 | 50.0 | 4.0 | 3.3 |
| K16919 | K08961/K12225 | 19 | 27.0 | 60.0 | 38.0 | 96.0 | 1.0 | 47.5 | 5.0 | 4.0 |
| K90902 | BEA/50B1807//LASSEN, **BELUGA** | 87 | 26.9 | 56.1 | 40.0 | 101.0 | 1.5 | 50.0 | 3.5 | 4.0 |
| K16949 | K12219/K08961 | 49 | 26.9 | 51.7 | 41.0 | 101 | 1.0 | 50.0 | 4.0 | 3.7 |
| K16925 | K11917/K08961 | 25 | 26.8 | 60.4 | 38.0 | 94 | 1.0 | 46.0 | 4.0 | 4.0 |
| K16910 | K08961/K12214 | 10 | 26.8 | 58.2 | 38.0 | 95 | 1.0 | 47.5 | 5.0 | 4.0 |
| K16937 | K08961/K12209 | 37 | 26.8 | 48.5 | 39.0 | 95 | 1.5 | 49.0 | 4.0 | 4.0 |
| K16932 | I05101/K08961 | 32 | 26.4 | 54.7 | 46.0 | 101 | 2.0 | 51.0 | 4.0 | 2.7 |
| K16945 | K12209/K08961 | 45 | 26.3 | 50.5 | 40.0 | 96 | 1.0 | 49.0 | 4.5 | 3.3 |

**EXPERIMENT 6211 PRELIMINARY WHITE KIDNEY YIELD TRIAL** **PLANTED: 6/10/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| K16948 | K12214/K13902 | 48 | 26.2 | 60.9 | 42.0 | 96 | 1.0 | 46.5 | 4.0 | 3.7 |
| K16964 | K08961/I13465 | 64 | 25.1 | 62.2 | 37.0 | 94 | 1.0 | 47.0 | 3.5 | 5.0 |
| K16966 | K08961/I13465 | 66 | 24.5 | 60.0 | 38.0 | 100.0 | 1.5 | 49.0 | 3.5 | 4.3 |
| K16946 | K12209/K08961 | 46 | 23.9 | 48.9 | 43.0 | 98.0 | 1.5 | 51.0 | 4.0 | 3.0 |
| K16916 | K08961/K12214 | 16 | 23.7 | 51.4 | 38.0 | 93 | 1.0 | 47.0 | 4.0 | 4.7 |
| K16936 | K08961/K12209 | 36 | 23.4 | 52.1 | 39.0 | 95 | 1.5 | 48.5 | 4.0 | 4.0 |
| K16956 | K11320/I13462 | 56 | 22.6 | 52.1 | 40.0 | 96 | 1.0 | 49.0 | 4.5 | 4.0 |
| K16908 | K08961/K12214 | 8 | 22.6 | 55.6 | 41.0 | 96 | 1.0 | 50.5 | 4.0 | 4.0 |
| K16912 | K08961/K12214 | 12 | 22.4 | 58.4 | 37.0 | 95 | 1.0 | 45.5 | 4.0 | 4.0 |
| K16947 | K12214/K13902 | 47 | 22.2 | 52.5 | 38.0 | 94 | 1.0 | 46.5 | 4.0 | 4.0 |
| K16921 | K08961/K12225 | 21 | 21.6 | 55.4 | 38.0 | 93 | 1.0 | 44.5 | 3.5 | 4.0 |
| K16965 | K08961/I13465 | 65 | 21.5 | 56.1 | 37.0 | 93 | 1.0 | 45.0 | 3.5 | 5.0 |
| K16922 | K08961/K12225 | 22 | 21.4 | 47.3 | 38.0 | 94.0 | 1.0 | 47.5 | 3.5 | 3.7 |
| K16938 | K08961/K12209 | 38 | 20.5 | 49.5 | 37.0 | 94.0 | 1.0 | 47.0 | 3.0 | 4.7 |
| K16918 | K08961/K12225 | 18 | 18.7 | 52.1 | 38.0 | 93 | 1.0 | 44.5 | 3.0 | 4.7 |
| K16920 | K08961/K12225 | 20 | 18.5 | 46.6 | 38.0 | 93 | 1.0 | 45.0 | 3.0 | 5.0 |
| K16915 | K08961/K12214 | 15 | 17.6 | 50.1 | 38.0 | 93 | 1.0 | 44.5 | 3.0 | 5.0 |
| K16917 | K08961/K12214 | 17 | 16.3 | 49.8 | 37.0 | 93 | 1.0 | 45.0 | 3.0 | 5.0 |
| MEAN (88) | | | 29.7 | 55.1 | 39.2 | 97.3 | 1.2 | 48.3 | 4.1 | 3.4 |
| LSD (.05) | | | 4.4 | 2.7 | 0.6 | 1.7 | 0.5 | 0.7 | 1.0 | 0.4 |
| CV (%) | | | 10.9 | 3.7 | 0.9 | 1.1 | 26.3 | 0.9 | 15.4 | 8.1 |

**EXPERIMENT 6212 PRELIMINARY MAYACOBA YIELD TRIAL** **PLANTED: 6/10/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| I14513 | DBY-28-1, **PATRON** | 9 | 27.8 | 49.3 | 44.0 | 96 | 3.0 | 45.7 | 3.0 | 3.0 |
| Y16503 | Y11405/UC Canario 707 | 3 | 25.9 | 41.7 | 43.0 | 97 | 1.0 | 49.3 | 3.7 | 3.3 |
| Y11405 | FR-07-AZP-14-06 | 8 | 24.1 | 47.9 | 41.0 | 96 | 1.0 | 49.0 | 4.0 | 4.3 |
| Y16501 | Y11405/PR1146-123 | 1 | 23.3 | 39.5 | 38.0 | 95 | 1.0 | 46.0 | 3.7 | 3.0 |
| Y16507 | PR1146-123/Y11405 | 7 | 22.7 | 45.1 | 39.0 | 94 | 1.0 | 45.3 | 4.3 | 3.0 |
| Y16505 | PR1146-123/Y11405 | 5 | 17.4 | 39.6 | 38.0 | 93 | 1.0 | 46.3 | 3.7 | 4.0 |
| Y16502 | Y11405/UC Canario 707 | 2 | 17.0 | 42.6 | 43.0 | 97 | 1.0 | 48.3 | 3.7 | 4.3 |
| Y16504 | PR1146-123/Y11405 | 4 | 14.7 | 37.7 | 39.0 | 95 | 1.0 | 44.7 | 3.3 | 4.3 |
| Y16506 | PR1146-123/Y11405 | 6 | 12.8 | 41.1 | 38.0 | 96 | 1.0 | 46.0 | 3.7 | 4.0 |
| MEAN (9) | | | 20.6 | 42.7 | 40.1 | 95.5 | 1.2 | 46.7 | 3.7 | 3.7 |
| LSD (.05) | | | 4.6 | 1.9 | 0.9 | 3.1 | 0.0 | 2.0 | 0.9 | 1.1 |
| CV (%) | | | 15.8 | 3.0 | 1.2 | 2.3 | 1.6 | 3.1 | 16.7 | 21.5 |

**EXPERIMENT 6213 NATIONAL WHITE MOLD YIELD TRIAL** **PLANTED: 6/13/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| B15430 | Zenith/B12721 | 9 | 41.6 | 27.6 | 43.0 | 101 | 1.0 | 53.7 | 5.3 | 1.0 |
| I13401 | SR 09303, **VIPER** | 47 | 39.0 | 34.3 | 44.0 | 100 | 1.7 | 49.7 | 4.0 | 3.0 |
| B15434 | Zenith/B12721 | 52 | 37.9 | 23.7 | 43.0 | 101 | 1.0 | 54.3 | 5.3 | 2.0 |
| R12844 | SR9-5/R09508 | 3 | 37.8 | 38.4 | 41.0 | 98.0 | 1.0 | 53.3 | 5.0 | 1.0 |
| B15442 | B11363/B09175 | 27 | 36.9 | 27.0 | 45.0 | 101 | 1.0 | 53.3 | 5.3 | 1.0 |
| B15431 | Zenith/B12721 | 32 | 36.7 | 26.1 | 42.0 | 100 | 1.0 | 53.3 | 5.7 | 2.0 |
| B15418 | B10208/B09175 | 28 | 36.2 | 26.0 | 46.0 | 103 | 1.3 | 52.7 | 4.3 | 1.0 |
| B15451 | B11371/B11363 | 30 | 35.9 | 23.5 | 46.0 | 101 | 1.0 | 51.7 | 4.7 | 1.0 |
| B10244 | B04644/ZORRO, **ZENITH** | 25 | 35.6 | 23.1 | 43.0 | 100 | 1.0 | 53.0 | 5.0 | 2.0 |
| I16724 | WM91212-4-3 | 6 | 35.6 | 42.4 | 42.0 | 99 | 1.3 | 52.3 | 4.7 | 2.0 |
| R12844 | SR9-5/R09508 | 45 | 35.6 | 40.3 | 43.0 | 99 | 1.7 | 53.3 | 5.0 | 1.0 |
| R98026 | R94037/R94161, **MERLOT** | 44 | 34.4 | 40.6 | 42.0 | 99.0 | 2.0 | 51.3 | 4.0 | 4.0 |
| B04554 | B00103*/X00822, **ZORRO** | 26 | 33.8 | 24.0 | 44.0 | 101 | 1.0 | 52.0 | 5.0 | 2.0 |
| S08418 | S02754/S04503, **ROSETTA** | 48 | 33.6 | 38.4 | 43.0 | 98 | 1.0 | 52.3 | 5.3 | 3.0 |
| P14814 | P11522/LONG'S PEAK | 40 | 33.4 | 41.6 | 45.0 | 101 | 1.0 | 52.3 | 6.0 | 3.0 |
| B15453 | B11371/B11363 | 31 | 32.6 | 24.7 | 44.0 | 103 | 1.0 | 52.7 | 4.7 | 2.0 |
| P07863 | AN-37/P02630, **ELDORADO** | 43 | 32.0 | 46.2 | 42.0 | 102.0 | 1.3 | 52.3 | 5.0 | 4.0 |
| G12901 | G07321/Fuji, **SAMURAI** | 37 | 31.6 | 30.8 | 43.0 | 103 | 2.0 | 51.3 | 4.3 | 3.0 |
| N15318 | N11277/N09034 | 20 | 31.5 | 24.6 | 45.0 | 103 | 2.0 | 52.0 | 4.3 | 2.0 |
| R13752 | Merlot/SER48 | 46 | 31.3 | 39.1 | 42.0 | 100 | 1.0 | 53.0 | 4.0 | 3.0 |
| B15441 | B11343/B10213 | 29 | 31.3 | 23.4 | 43.0 | 101 | 1.0 | 50.7 | 4.7 | 3.0 |
| G14505 | G11429/P08175 | 36 | 31.0 | 28.2 | 42.0 | 99 | 1.0 | 51.3 | 5.0 | 2.0 |
| N14229 | N11275/N11256 | 18 | 30.6 | 19.3 | 44.0 | 98 | 1.0 | 52.3 | 5.7 | 3.0 |
| G13479 | Eldorado/G09312 | 35 | 30.6 | 31.6 | 42.0 | 102 | 1.0 | 51.7 | 4.3 | 2.0 |
| N14218 | N11256/N11298 | 19 | 30.0 | 19.3 | 46.0 | 98 | 1.0 | 52.7 | 5.7 | 3.0 |
| N15306 | N11230/N11298 | 23 | 29.9 | 19.9 | 46.0 | 102.0 | 1.0 | 53.3 | 5.0 | 3.0 |
| P14815 | P11522/LONG'S PEAK | 41 | 29.9 | 45.0 | 42.0 | 98 | 1.0 | 51.3 | 5.0 | 3.0 |
| I14520 | Santa Fe/PS08-108, SF103-8, **PALOMINO** | 42 | 29.9 | 43.1 | 42.0 | 102 | 3.0 | 47.0 | 3.7 | 4.0 |
| I13445 | 039-A-5 | 5 | 29.8 | 39.1 | 43.0 | 101 | 1.7 | 53.7 | 4.7 | 4.0 |
| G13444 | G07302//G08274/P08410 | 34 | 29.3 | 42.4 | 42.0 | 98.0 | 1.3 | 50.7 | 5.3 | 3.0 |
| N15345 | N11258//N11264/Merlin | 21 | 29.3 | 21.1 | 44.0 | 101 | 1.3 | 52.3 | 5.0 | 2.0 |
| K11306 | K06621/USDK-CBB-15 | 53 | 29.3 | 52.3 | 39.0 | 102.0 | 1.0 | 48.0 | 5.0 | 2.0 |
| R13752 | Merlot/SER48 | 7 | 29.2 | 41.4 | 42.0 | 100 | 1.3 | 53.3 | 4.3 | 3.0 |
| N13142 | N08007/N09046 | 17 | 29.1 | 22.1 | 43.0 | 104 | 1.7 | 51.0 | 4.3 | 2.0 |
| I15621 | **MIST** | 15 | 28.8 | 23.3 | 43.0 | 104 | 1.0 | 50.0 | 4.0 | 1.0 |
| P14802 | P08162/P11518 | 38 | 28.4 | 40.4 | 44.0 | 97 | 2.3 | 49.3 | 4.3 | 3.0 |
| I08933 | 37-2, USPT-WM-12 | 4 | 28.4 | 41.7 | 43.0 | 96.0 | 2.3 | 47.7 | 4.0 | 3.0 |
| P14815 | P11522/LONG'S PEAK | 2 | 28.4 | 45.1 | 43.0 | 98 | 1.7 | 51.0 | 4.3 | 3.0 |
| P14812 | P09425/P08161 | 39 | 28.3 | 43.0 | 42.0 | 97 | 1.7 | 48.0 | 4.3 | 3.0 |
| N11283 | MEDALIST/N08003, **ALPENA** | 13 | 28.2 | 21.1 | 43.0 | 101.0 | 1.0 | 53.3 | 5.3 | 3.0 |

**EXPERIMENT 6213 NATIONAL WHITE MOLD YIELD TRIAL** **PLANTED: 6/13/16**

| 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| N15335 | N12453/N11277 | 22 | 27.9 | 20.7 | 43.0 | 96 | 1.0 | 47.7 | 4.3 | 2.0 |
| I16725 | 08072, **BLIZZARD** | 50 | 27.2 | 22.5 | 43.0 | 100 | 1.3 | 52.3 | 4.0 | 3.0 |
| N13120 | N08003/N05324 | 16 | 27.1 | 23.6 | 43.0 | 97 | 1.0 | 50.3 | 5.0 | 2.0 |
| N15341 | N12468/N12466 | 8 | 26.9 | 21.5 | 45.0 | 102 | 1.3 | 52.0 | 4.3 | 2.0 |
| B15408 | B09175/B10215 | 51 | 26.9 | 22.3 | 44.0 | 99 | 1.3 | 50.0 | 4.3 | 2.0 |
| I13419 | NDF09304 | 55 | 25.6 | 20.1 | 43.0 | 100 | 1.0 | 50.7 | 4.0 | 3.0 |
| I15652 | ND121630 | 56 | 24.6 | 39.7 | 44.0 | 99 | 1.0 | 54.3 | 5.0 | 3.0 |
| N15346 | N09020/B09204//B10238/B11343 | 24 | 22.8 | 20.0 | 45.0 | 102.0 | 1.0 | 51.7 | 5.0 | 2.0 |
| I11264 | COOP 03019, MERLIN | 14 | 22.5 | 20.5 | 43.0 | 99.0 | 1.0 | 50.7 | 4.3 | 4.0 |
| G08254 | G04514/Matterhorn, **POWDERHORN** | 33 | 16.7 | 35.3 | 41.0 | 96.0 | 1.7 | 50.0 | 5.3 | 2.0 |
| I81010 | JAPON3/MAGDALENE, **BUNSI** | 12 | 12.7 | 20.9 | 40.0 | 100 | 3.0 | 45.7 | 3.0 | 3.0 |
| I96417 | G122 MAGNUSON | 10 | 11.9 | 40.2 | 39.0 | 102 | 2.0 | 49.0 | 3.0 | 4.0 |
| I89011 | RB,**BERYL** | 11 | 11.4 | 33.3 | 40.0 | 97 | 3.7 | 40.0 | 3.0 | 2.0 |
| S14706 | Rosetta/S11707 | 49 | 10.0 | 43.9 | 43.0 | 102 | 1.3 | 49.0 | 4.0 | 1.0 |
| K14807 | Snowdon/Isabella | 54 | 8.2 | 52.0 | 35.0 | 95.0 | 1.0 | 45.7 | 4.3 | 4.0 |
| I16723 | ASR 1865 | 1 | 6.5 | 20.8 | 40.0 | 100.0 | 2.0 | 48.3 | 3.0 | 3.0 |
| MEAN (56) | | | 28.6 | 31.5 | 42.6 | 100.0 | 1.4 | 51.0 | 4.6 | 2.5 |
| LSD (.05) | | | 4.2 | 1.4 | 1.9 | 1.9 | 0.5 | 2.0 | 0.6 | (1 rep) |
| CV (%) | | | 10.8 | 3.4 | 2.7 | 1.4 | 24.6 | 2.9 | 10.0 | 35.5 |

**2016 White Mold Fungicide Trial**
**Giles Farm, Wheeler, Michigan**

| Treatment | Application Code | Rate | Incidence % infection | Severity %severity | %Pick | YIELD |
|---|---|---|---|---|---|---|
| Untreated Check | | | 86 | 69 | 3.3 | 2365 |
| Propulse | 8 oz | AB | 48 | 36 | 2.0 | 3257 |
| Propulse | 10.3 oz | AB | 46 | 37 | 1.6 | 3569 |
| Propulse | 8 oz | A | 55 | 40 | 2.5 | 3256 |
| Omega | 8 oz | B | | | | |
| Propulse | 8 oz | C | | | | |
| Omega | 8 oz | AB | 64 | 52 | 2.3 | 3333 |
| Omega | 8 oz | A | 80 | 66 | 3.7 | 2386 |
| Edura | 8 oz | AB | 52 | 39 | 1.7 | 3606 |
| Edura | 8 oz | A | 69 | 54 | 2.3 | 2960 |
| Edura+Omega | 6+6 oz | A | 69 | 54 | 3.0 | 2645 |
| Edura+Omega | 6+6 oz | AB | 56 | 43 | 1.9 | 3455 |
| Propulse+Omega | 6+6 oz | A | 68 | 52 | 3.0 | 2912 |
| Propulse+Omega | 6+6 oz | AB | 42 | 29 | 1.5 | 3906 |
| Aproach | 12 oz | AB | 79 | 66 | 3.5 | 2465 |
| | | LSD .05 = | 9.7 | 8.3 | 1.0 | 710 |
| | | C. V. = | 10.9% | 11.9% | 27.7% | 16.1% |

Located at Varner Farm, Midland County
Application Code:A=100% or first bloom, B=10 days after 100% bloom, C=16 after 100% bloom
Rating Date: % infection "rating" on September 25, % Incidence, % Severity
Viper Small Red Beans planted in 20" rows. Population of 115,680. 5 Irrigations of one inch per week.
Planted:June 7 Harvested: October 11
First Spray: July 23, Second Spray: August 1, Third Spray: August8
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. Yield reported in pounds per acre.

A field trial was conducted to determine the efficacy of various fungicide applications on controlling white mold in Midland County. The white mold trial had twelve treatments and one non-sprayed control with four replications of each treatment. Four fungicides were used, either by itself or in combination with another fungicide.

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan State University AgBioResearch

# Early-Harvest Sugarbeet Nitrogen Response

Kurt Steinke and Andrew Chomas, Michigan State University

| | |
|---|---|
| **Location**: Saginaw Valley Research and Extension Center | **Tillage**: Conv., 30-in. row |
| **Planting Date**: April 19, 2016 **(Harvest 8/29/16)** | **N Rates**: See below |
| **Soil Type**: Clay loam; 3.0 OM; 7.1 pH; 48 ppm P; 182 ppm K | **Population**: 4 ¼ in. spacing |
| **Variety**: Crystal RR059<br>**Prev. Crop**: Non-interseeded winter wheat | **Replicated**: 4 replications |

| N Trt. (Total lb. N/A) | RWSA | RWST | Tons/A | % Sugar | % CJP | NH2 | Amino-N |
|---|---|---|---|---|---|---|---|
| 0 – Check | 4333 | 216 | 20 | 14.6 | 96.0 | 74 | 5.3 |
| 40 | 6537 | 225 | 29 | 15.2 | 95.8 | 86 | 6.2 |
| 80 | 6223 | 215 | 29 | 14.5 | 95.9 | 94 | 6.9 |
| 120 | 5586 | 207 | 27 | 14.1 | 95.6 | 107 | 8.0 |
| 160 | 6351 | 199 | 32 | 13.6 | 95.5 | 133 | 10.3 |
| **$LSD_{(0.10)}$[a]** | **694** | **7.5** | **3.2** | **0.4** | **NS** | **11** | **1.0** |

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

| N Trt. (Total lb. N/A) | Gross Grower Payment ($/A) | Net Economic Return Minus N Costs ($/A)[a] | Net Economic Return Minus N Costs and Trucking ($/A)[b] |
|---|---|---|---|
| 0 – Check | 1309 | 1309 | 1234 |
| 40 | 1977 | 1963 | 1854 |
| 80 | 1889 | 1861 | 1752 |
| 120 | 1693 | 1651 | 1550 |
| 160 | 1929 | 1873 | 1753 |

[a, b] Gross grower payment and net economic returns based upon a $35/ton base payment with early delivery, volume, and quality incentives; N price of $0.35/lb.; trucking costs of $3.75/T.

**Summary**: Trial quality was good to excellent. All treatments received 40 lbs. N/A as 28%, 20 lbs. $P_2O_5$/A, 50 lbs. $K_2O$/A. and 2 lbs. Mn/A as starter placed 2x2 on April 19 (check plots did not receive any N). The 40 lb. N/A treatment received no supplemental N beyond the starter application. Sidedress N applications were completed at the 2-4 leaf stage on May 24. In the current study, nitrogen treatments receiving 40 lb. total N (40 N as 2x2) resulted in the best combination of tonnage and sugar quality for this early harvest date.

MICHIGAN STATE UNIVERSITY EXTENSION

Michigan State University AgBioResearch

# Sugarbeet Nitrogen Response Following Wheat

Kurt Steinke and Andrew Chomas, Michigan State University

| | |
|---|---|
| **Location**: Saginaw Valley Research and Extension Center | **Tillage**: Conv., 30-in. row |
| **Planting Date**: April 19, 2016 (Harvest 10/6/16) | **N Rates**: See below |
| **Soil Type**: Clay loam; 3.0 OM; 7.1 pH; 48 ppm P; 182 ppm K | **Population**: 4 ¼ in. spacing |
| **Variety**: Crystal RR059 | **Replicated**: 4 replications |

| N Trt. (Total lb. N/A) | RWSA | RWST | Tons/A | % Sugar | % CJP | NH2 | Amino-N |
|---|---|---|---|---|---|---|---|
| 0 – Check | 8363 | 261 | 32 | 17.3 | 96.2 | 96 | 6.2 |
| 40 | 9394 | 255 | 37 | 17.0 | 95.7 | 136 | 9.1 |
| 80 | 10670 | 266 | 40 | 17.8 | 95.7 | 131 | 8.6 |
| 120 | 9839 | 252 | 39 | 16.9 | 95.7 | 175 | 11.6 |
| 160 | 10335 | 247 | 42 | 16.8 | 94.8 | 177 | 11.7 |
| 200 | 9067 | 232 | 39 | 16.0 | 94.6 | 232 | 16.4 |
| 240 | 10347 | 231 | 45 | 15.9 | 94.4 | 280 | 19.2 |
| 160N Total 1T/A chicken manure with 66N SD | 10581 | 246 | 43 | 16.8 | 94.8 | 205 | 13.4 |
| 160N Total 2T/A chicken manure with 13N SD | 9556 | 245 | 39 | 16.7 | 94.9 | 159 | 10.5 |
| **$LSD_{(0.10)}$[a]** | **NS** | **12.6** | **5.7** | **0.7** | **0.6** | **71** | **4.7** |

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

| N Trt. (Total lb. N/A) | Gross Grower Payment ($/A) | Net Economic Return Minus N Costs ($/A)[a] | Net Economic Return Minus N Costs and Trucking ($/A)[b] |
|---|---|---|---|
| 0 – Check | 1258 | 1258 | 1138 |
| 40 | 1421 | 1407 | 1268 |
| 80 | 1602 | 1574 | 1424 |
| 120 | 1480 | 1438 | 1292 |
| 160 | 1562 | 1506 | 1348 |
| 200 | 1363 | 1293 | 1147 |
| 240 | 1565 | 1481 | 1312 |
| 1 T/A + 66N | 1593 | 1426 | 1265 |
| 2 T/A +13N | 1439 | 1146 | 1000 |

[a, b] Gross grower payment and net economic returns based upon a $35/ton base payment with volume and quality incentives, an N price of $0.35/lb., chicken manure bulk price of $144/T, and trucking costs of $3.75/T.

**Summary**: Trial quality was good to excellent. Previous wheat crop was not interseeded with a leguminous cover crop. All treatments received 40 lbs. N/A as 28%, 20 lbs. $P_2O_5$/A, 50 lbs. $K_2O$/A. and 2 lbs. Mn/A as starter placed 2x2 on April 19 (check plots did not receive any N). The 40 lb. N/A treatment received no supplemental N beyond the starter application. Sidedress N applications were completed at the 2-4 leaf stage on May 24.

The 2016 growing season was a tale of two seasons. Dry spring conditions facilitated timely planting but April precipitation was > 60% below the 30-year average and both May and June precipitation totals were > 50% below the 30-year average. Dry soil conditions likely limited N losses early but some timely rain events on June 5 and June 16 had beet stands and canopies looking good. July and August rainfall totals were above 30-year averages with 3.5 and 5.2 inches, respectively. While the autumn season was below average from a precipitation standpoint, many soils never dried out from the late summer rains and beets had ample moisture throughout this time period. The increased beet tonnage typically observed with above-recommended N rate applications occurs after Sept 1. Moist autumn soil conditions and warm air and soil temperatures may have limited some root bulking and sugar storage. Autumn growth conditions may not have been adequate to sufficiently dilute beet N concentrations thus further contributing to the lower sugar contents reported across the region. Moist autumn conditions, increased reports of leafspot, warmer fall temperatures lessening sugar storage, and in some cases dry spring conditions impacting stand emergence may have all impacted the 2016 sugarbeet season. In this particular study, nitrogen treatments receiving around 80 lb. total N (40 N as 2x2 and 40 N sidedress) resulted in the best combination of tonnage and sugar quality. Rates greater than 80 lb. total N did not significantly increase yield, decreased RWSA, and increased amino-N concentrations. No significant differences in residual soil N after harvest were present among the 0-240 N rates in this study.

**MSU Wheat Breeding and Genetics 2016 Report**

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## Introduction

Michigan had the highest non-irrigated wheat yield in the United States at 89 bu/ac in 2016 (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 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 2016. As part of the variety development program, preliminary yield trials (PYT) and advanced yield trials (AYT) were conducted in order to target new high yielding varieties to the thumb region. The second year of yield testing was done with an introgression and association mapping population that samples diversity from a wild ancestral wheat leading to the identification of large effect genes controlling grain yield

## MSU Wheat Breeding and Genetics Preliminary Yield Trials

### Trial Design

An augmented design was used where new entries were planted in single replicates. Check varieties were replicated across blocks to account for field variation. Effects of individual blocks were determined and yield values of experimental lines were adjusted accordingly. ANOVA using the two check varieties was used to estimate error across the experiment and determine significance thresholds. The main check, Ambassador was replicated four times in each block. Additional checks were planted randomly across the field.

### Plant Materials

Advanced yield trials were comprised of 100 elite soft red and soft white winter wheat entries and the check varieties Ambassador and DF112R (Table 1). Preliminary yield trials were comprised of 1000 new soft red and soft white winter wheat entries and the check varieties Ambassador and Pioneer 25R40 (Table 2).

### Results and Discussion

Higher grain yields were seen in 2016 relative to 2015. Although rainfall during the grain filling period was minimal, yields were quite good. Heavy stripe rust pressure influenced grain yield in experiments not treated with a fungicide. In the 2016 PYT, 41 lines yielded significantly higher than the check, Ambassador. From the AYT, 100 lines are being tested in 2017 replicated trials. From the 2016 AYT, 23 elite lines yield higher than Ambassador across all locations.

**Table 1.** Wheat lines in preliminary testing with grain yield significantly higher than the check variety Ambassador.

| Line | Pedigree | Grain Color | Grain Yield (bu/ac) |
|---|---|---|---|
| MI14W0906 | MISC HDS-148 / VA03W-412 | White | 106.8 |
| MI14W0742 | UNKNOWN | White | 103.6 |
| MI14W0860 | Award / D8006 | White | 102.1 |
| MI14W0771 | Algood / MI D8006 | White | 101.7 |
| MI14W0895 | SE999247C-1 / VA05W-414 | White | 101.3 |
| MI14W0772 | P25W60 / OR941550 | White | 101.2 |
| MI15W0347 | Ambassador//BRS Umbu/Jensen | White | 101.1 |
| MI14W1066 | VA03W-409 / E0028 | White | 100.6 |
| MI15W0367 | Ambassador//Jensen/Glosa | White | 100.6 |
| MI15W0174 | D8006 /3/ Crystal // E6002 / Aubrey | White | 100.4 |
| MI15W0105 | Aubrey /3/ Crystal // Truman / E2017 | White | 99.9 |
| MI14W0750 | P25W33/MI D9070 | White | 99.6 |
| MI14W1039 | Ambassador / D6234 | White | 99.3 |
| MI14W0903 | MISC HDS-148 / VA03W-412 | White | 99.2 |
| MI15W0370 | BRS Umbu/Jensen//Ambassador | White | 99.2 |
| MI14W1016 | E0028 // Pioneer 25R47 / E6003 | White | 99.1 |
| MI14W1005 | E0028 // Pioneer 25R47 / E6003 | White | 99.0 |
| MI14W0919 | T63/PION2737W | White | 98.8 |
| MI15W0474 | E5011B // Red Ruby / Truman | White | 98.1 |
| MI15W0366 | Ambassador//Jensen/Glosa | White | 97.9 |
| MI15W0486 | SE0010286-7 / VA05W-414 | White | 97.9 |
| MI14W0947 | E5011B / VA05W-775 | White | 97.8 |
| MI15W0447 | Crystal // E2017 / MO 050699 | White | 97.6 |
| MI14R1266 | VA03W-409 / E0028 | Red | 105.2 |
| MI15R0181 | D8006R / OH05-249-32 | Red | 102.9 |
| MI15R0284 | Hopewell / P.0128A1-22-22 | Red | 102.2 |
| MI15R0416 | Male Sterile Selection | Red | 101.5 |
| MI15R0432 | MISC HDS-148 / VA03W-412 | Red | 101.2 |
| MI15R0426 | Ambassador//Jensen/Glosa | Red | 101.1 |
| MI15R0093 | Aubrey / P.0537A1-7-12 | Red | 100.6 |
| MI15R0096 | Aubrey // E5011B / Pioneer 25R47 | Red | 100.4 |
| MI15R0428 | UNKNOWN | Red | 100.3 |
| MI15R0097 | Aubrey // E5011B / Pioneer 25R47 | Red | 100.0 |
| MI14R1145 | Hopewell / P03207A1-7 | Red | 99.7 |
| MI14R1162 | Hopewell // E0028 / MO 050699 | Red | 99.4 |
| MI14R1127 | E0028 / VA03W-409 | Red | 99.4 |
| MI15R0388 | OH04-264.58/Truman | Red | 98.8 |

**Table 1 cont.**

| Line | Pedigree | Grain Color | Grain Yield (bu/ac) |
|---|---|---|---|
| MI15R0420 | Ambassador//Jensen/Glosa | Red | 98.5 |
| MI14R1173 | Aubrey / MO050699 | Red | 98.3 |
| MI15R0390 | OH04-264-58 /Truman | Red | 98.2 |
| MI15R0510 | VA03W-409 / D8006W | Red | 98.1 |
| Pioneer 25R40 | P25R37/P25R40 | Red | 101.4 |
| Ambassador | P2733/D1148 | White | 85.9 |

**Table 2.** Wheat lines moved from advanced yield trials into the 2017 Michigan State Performance Trials. Grain yield in bu/ac are from SVREC and four additional locations in 2016.

| Line | Pedigree | Grain Color | All Locations | SVREC 2016 | SVREC 2015 |
|---|---|---|---|---|---|
| MI14W0003 | Unknown | White | 96.8 | 98.0 | 72.8 |
| MI14W0013 | Unknown | White | 91.8 | 97.9 | 78.3 |
| MI14W0054 | P25W33/D8006W | White | 93.8 | 115.7 | 88.9 |
| MI14W0064 | Ambassador/Jupiter | White | 94.3 | 90.0 | 84.9 |
| MI14W0190 | Jupiter/3/E6003//FHB12/Ambassador | White | 92.7 | 93.5 | 87.3 |
| MI14W0245 | Oasis/Ambassador | White | 89.3 | 83.1 | 88.9 |
| MI14W0250 | Shirley/Ambassador | White | 92.7 | 80.0 | 85.1 |
| MI14W0300 | Aubrey/MO050699 | White | 87.4 | 87.8 | 85.8 |
| MI14W0334 | D8006W//FHB12/D8006 | White | 91.9 | 87.3 | 85.7 |
| MI14W0598 | E0027/E5201 | White | 94.6 | 111.8 | 92.9 |
| MI14W0652 | TW93213/D6234 | White | 93.3 | 98.9 | 90.4 |
| MI14R0008 | Unknown | Red | 84.9 | 77.3 | 97.2 |
| MI14R0009 | Unknown | Red | 84.2 | 97.5 | 97.4 |
| MI14R0011 | Unknown | Red | 97.8 | 110.8 | 82.0 |
| MI14R0029 | SE0010286-7/VA05W-257 | Red | 87.7 | 101.3 | 98.4 |
| MI14R0160 | Jupiter/D6234 | Red | 93.9 | 91.1 | 86.6 |
| MI14R0213 | Jupiter//MO050699/Truman | Red | 96.3 | 98.1 | 80.9 |
| MI14R0267 | Oasis/D8006W | Red | 91.4 | 98.6 | 83.0 |
| MI14R0288 | Shirley/RedRuby | Red | 90.3 | 84.8 | 78.3 |
| MI14R0330 | D8006W//FHB12/P25R47 | Red | 91.3 | 84.4 | 87.5 |
| MI14R0421 | D8006/P25R37 | Red | 89.0 | 83.8 | 86.3 |
| MI14R0489 | D6234/NYBatavia | Red | 95.7 | 129.0 | 80.4 |
| MI14R0593 | Hopewell/E5201 | Red | 90.9 | 81.5 | 79.3 |
| Ambassador | P25W33/D1148 | White | 84.0 | 89.9 | 77.2 |
| DF112R | - | Red | - | 97.3 | - |

**The D genome Nested Association Mapping Population (DNAM)**

The D genome of hexploid wheat has very narrow genetic diversity. A population was developed to evaluate new alleles from the D genome species, *Aegilops tauschii*. A set of 407 $BC_2$-derived recombinant inbred lines (RILs), the recurrent parent, KS05HW14 and the local check, Ambassador, were yield tested in 2015 and 2016. Lines were identified having grain yield higher than both the recurrent parent and the variety, Ambassador (Figure 1). Association analysis of grain yield identified two large effect QTL on chromosomes 2DS and 6DL (Figure 2). Several smaller effect QTL were identified from *Ae. tauschii.* Genes conferring higher grain yield are being incorporated into to MSU wheat breeding program.

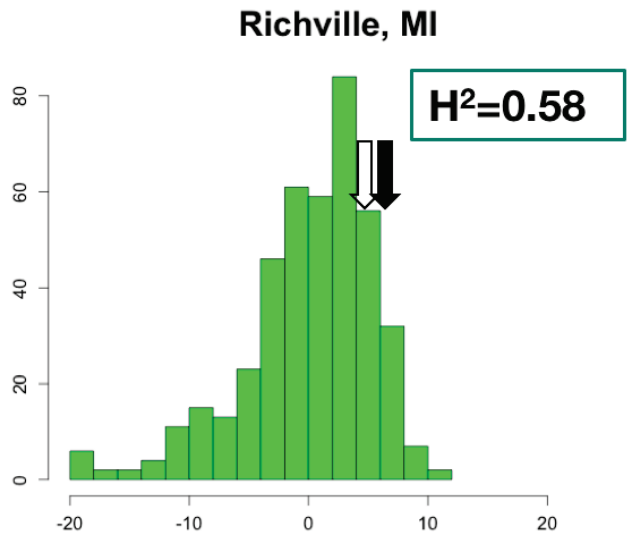


**Figure 1.** Histogram of BLUPs for grain yield from RILs of the DNAM and checks. Heritability for grain yield for 2015 and 2016 combined was 0.58. The solid arrow is the recurrent parent, KS05HW14. The hollow arrow is the check variety, Ambassador.

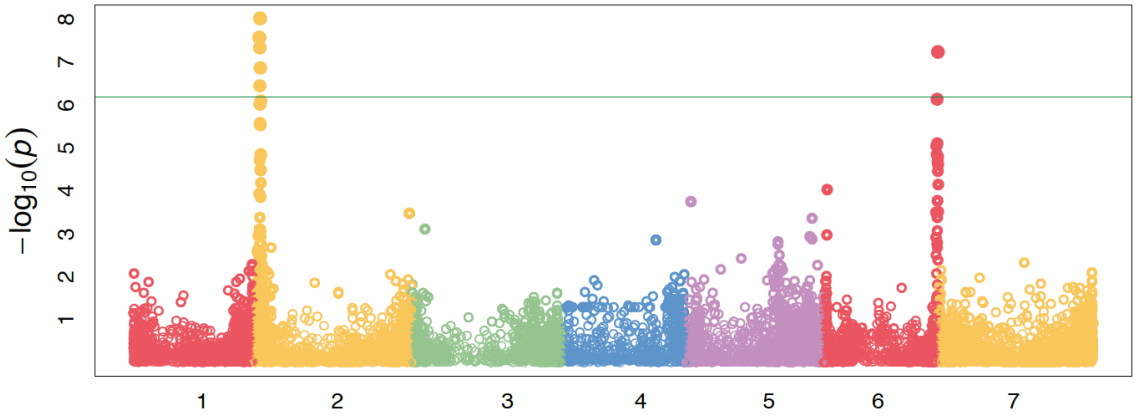


**Figure 2.** Manhattan plot showing significant grain yield QTL identified at SVREC on chromosomes 2DS and 6DL.