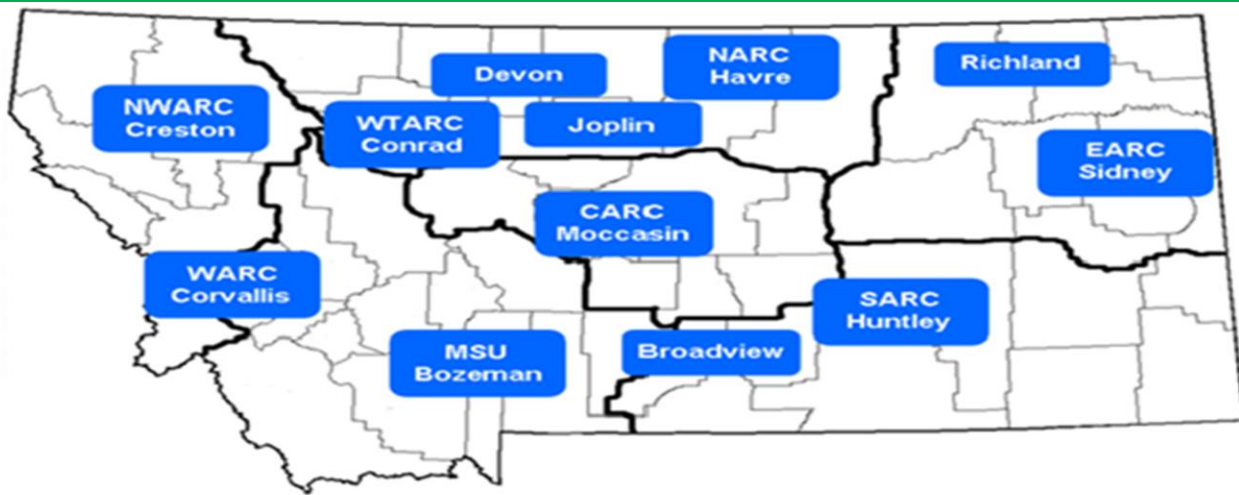


2017 Montana Cool-Season Spring Pulse Variety Evaluation Annual Report

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List of Seed Suppliers

Table 1 shows the lists of seed companies who submitted seeds for 2017 variety evaluation in Montana. The seed suppliers could be contacted for more information about the respective crops and varieties. This table is not exhaustive in listing seed suppliers for all varieties evaluated in 2017 since some of the varieties received from breeders are not yet released, and lack of adequate information for some cultivars used as check for some cases.

Table 1. The dry pea, lentil and chickpea varieties included in 2017 variety evaluation trials and seed suppliers

| Crop | Variety | Seed supplier | Seed type |
|----------------|-------------------|----------------------|------------------|
| Dry pea | AAC Carver | Meridian Seeds | Yellow |
| | AAC Lacombe | Seed Net Inc. | Yellow |
| | AC Earlystar | Meridian Seeds | Yellow |
| | Aragorn | Pulse USA/check | Green |
| | Arcadia | Pulse USA | Green |
| | Banner | ProGene | Green |
| | Bluemoon | Jerry Blotter | Green |
| | Bridger | Great Northern Ag | Yellow |
| | CDC Amarillo | Meridian Seeds | Yellow |
| | CDC Greenwater | Meridian Seeds | Green |
| | CDC Inca | Meridian Seeds | Yellow |
| | CDC Meadow | Meridian Seeds | Yellow |
| | CDC Patrick | Meridian Seeds | Green |
| | CDC Raezer | Meridian Seeds | Green |
| | CDC Saffron | Meridian Seeds | Yellow |
| | CDC Treasure | Meridian Seeds | Yellow |
| | Delta | Used as check | Yellow |
| | DS Admiral | Pulse USA/check | Yellow |
| | Durwood | Pulse USA | Yellow |
| | Ginny | ProGene | Green |
| | Greenwood | ProGene | Green |
| | Gunner | Great Northern Ag | Yellow |
| | Hampton | Chahill Seeds | Green |
| | Hyline | Great Northern Ag | Yellow |
| | Jetset | Meridian Seeds | Yellow |
| | Korando | Pulse USA | Yellow |
| | LG Koda (LN 1123) | Pulse USA | Green |
| | Majestic | JB Farm | Yellow |
| | SW Marquee | STI | Yellow |
| | Majoret | Pulse USA/check | Green |
| | Navarro | Great Northern Ag | Yellow |
| | Nette 2010 | Pulse USA/check | Yellow |
| | Salamanca | Great Northern Ag | Yellow |
| | Shamrock | Great Northern Ag | Green |
| Spider | Great Northern Ag | Yellow | |
| Viper | Pulse USA | Green | |
| Lentil | CDC Maxim CL | Pulse USA | Small red |
| | CDC Invincible | Pulse USA | Small green |
| | CDC Imi-Green | Pulse USA | Medium green |
| | CDC Impala CL | Pulse USA | Small red |
| | CDC Impress CL | Pulse USA | Medium green |
| | CDC Dazil CL | Pulse USA | Small red |
| | CDC Proclaim CL | Pulse USA | Small red |
| CDC Peridot CL | Pulse USA | French green | |
| Chickpea | CDC Orion | Meridian Seeds | Kabuli type |

PROJECT DESCRIPTION AND OBJECTIVE

Project Description

Cool season spring pulse crops (dry pea, lentil and chickpea) production in Montana is increasing rapidly. In order to enhance yield and quality, information on varietal testing and improved agronomic management practices are needed. The Eastern Agricultural Research Center (EARC) of Montana State University (MSU) is currently coordinating a series of Statewide dry pea, lentil and chickpea variety evaluation projects across Montana.

This project is designed to work together with pulse breeders and researchers from Montana State University, North Dakota State University, USDA-ARS Pullman, WA, Saskatchewan University, Canada, private seed companies and pulse growers. In 2017, the trials were conducted at seven Agricultural Research Centers and Bozeman Post Farm of MSU plus two cooperating producers' fields near Broadview and Richland, Montana. The research results from the project will provide unbiased information to stakeholders thus helps to enhance crop diversification. This will have substantial contribution to achieve economic, social and environmental sustainability in the state. This annual report contains the results of those evaluations and a summary from multiple years. The report is available to stakeholders free of charge to promote pulse production and crop diversification in Montana.

Objective

The objective of these trials was to evaluate spring dry pea, lentil and chickpea commercial varieties and experimental lines for adaptability and yield potential across Montana State.

METHODS

Procedures and Experimental Design

The Eastern Agricultural Research Center (EARC) invited individual private seed companies and breeders to submit dry pea, lentil and chickpea varieties for 2017 evaluation. Available locations for evaluation were indicated in the invitation letter. All sites were dry land except three irrigated sites (Corvallis, Huntley, and Sidney). In 2017, the Western Regional variety evaluations, usually organized by the breeders at USDA Pullman, WA, were not included due to seed delay. The EARC (coordinating center) treated all the seeds with fungicides (Apron MAXX[®] RTU, Syngenta Crop Protection, Inc.) to protect fungal diseases. Furthermore, the seeds were additionally treated with thiamethoxam insecticide (Cruiser MAXX[®], Syngenta Crop Protection, Inc.) to minimize pea leaf weevil damage. Seeds were tested for germination upon arrival, packaged per plot and randomized at EARC, and shipped to testing sites together with appropriate rhizobium inoculant. The seed rates were 8, 12 and 5 live seeds per ft² for pea, lentil and chickpea, respectively. The experiments were carried out in randomized complete block design with four replications in most of the locations. Plot size varied from site to site depends on land availability and equipment used for seeding and harvesting. Best management practices were followed during trial management using available resources at each site. The researchers at the respective sites managed the trials and recorded plant density, plant height, days to flowering, grain yield, test weight, grain moisture content and thousand kernel weights for most of the sites and submitted the data to the coordinating office. In addition, the coordinating center received subsamples from the collaborators for further quality testing. Grain yield data was adjusted to 13% moisture content before statistical analysis when this information is available. Analysis of variance were done using GLM of SAS statistical package (SAS 9.4). The LSMEANS (@ $\alpha = 0.05$) procedure was used to differentiate treatment means effects.

Collaborators and Experimental Locations

The type and number of these pulse crops and varieties evaluated at the different sites varied from site to site depending on the interest of seed suppliers and availability of resources at the respective sites. The collaborating research sites, location and type of crops they evaluated in 2017 are shown in Table 2.

Table 2. Summary table showing collaborators and locations participated in 2017 spring pulse variety evaluation trials in Montana.

| Collaborators [†] | Location | Conditions | Pea | Lentil | Chickpea | Observations/Remark |
|----------------------------|--------------------|------------|-----|--------|----------|---------------------------------------|
| CARC | Moccasin | Dry land | X | X | X | Too dry and deer problem for chickpea |
| EARC | Richland | Dry land | X | X | X | Too dry |
| EARC | Sidney | Irrigated | X | X | X | |
| EARC | Sidney | Dry land | X | X | X | Too dry |
| PSPP | Bozeman, Post Farm | Dry land | X | X | X | |
| NARC | Havre | Dry land | X | X | | Too dry |
| NWARC | Creston | Dry land | X | X | | |
| SARC | Broadview | Dry land | X | X | | Too dry |
| SARC | Huntley | Dry land | X | X | X | |
| SARC | Huntley | Irrigated | X | X | X | |
| WARC | Corvallis | Irrigated | | X | X | |
| WTARC | Conrad | Dry land | X | X | X | |

[†]CARC = Central Agricultural Research Center, EARC = Eastern Agricultural Research Center, PSPP = Plant Sciences and Plant Pathology, NARC = Northern Agricultural Research Center, NWARC = Northwest Agricultural Research Center, SARC = Southern Agricultural Research Center, WARC = Western Agricultural Research Center, WTARC = Western Triangle Agricultural Research Center.

Site Information and Agronomic Management Practices

Precipitation, site information and agronomic management practices for the respective sites are summarized in Tables 3 and 4.

Precipitation

The total amount of precipitation received from April 1, 2017 to Aug 31, 2017 varied from location to location. Generally, 2017 growing season precipitation was very low and resulted in low yield in most of the locations. The amount of total precipitation and irrigation applied at each

location is shown in Table 3. Among the different sites, Havre received very low precipitation during this growing period but still produced significant yield. This is mainly due to stored residual moisture available at planting and precipitation received in the month of June which is critical for grain formation at this time of the growing season. Moccasin received the highest precipitation than other locations.

Table 3. Growing season and long term average precipitation and irrigation amount applied for each location.

| | Bozeman (LRES) | Conrad (WTARC) | Corvallis (WARC) | Creston (NWARC) | Havre (NARC) | Huntley (SARC) | Moccasin (CARC) | Sidney (EARC)irri | Sidney (EARC)Dry |
|--|---------------------------|---------------------------|-----------------------------|----------------------------|-------------------------|---------------------------|----------------------------|------------------------------|-----------------------------|
| Seasonal precipitation (Apr. – Aug, 2017) (“) | 5.4 | 6.52 | 6.28 | 5.72 | 2.27 | 4.86 | 7.78 | 4.12 | 3.92 |
| Site Average (“) | | 8.5 | 2.6 | 9.3 | 8.0 | 8.8 | 10.7 | 5.8 | 5.8 |
| Irrigation applied (“) | | | 10.5 | | | 2.0 | | 5.81 | |

Agronomic practices

The previous crops, seeding and harvesting dates, fertilization and weed management were different for the different testing sites. The summary of these practices and soil types by location are shown in Table 4.

Table 4. Major site information and agronomic management practices by location for 2017

| | Bozeman (LRES) | Conrad (WTARC) | Corvallis (WARC) Irri. | Creston (NWARC) | Sidney dry and Irri. (EARC) | Havre (NARC) | Huntley (SARC) Dryland, Irri. and Broadview | Moccasin (CARC) | Richland |
|-----------------------------------|--|---|-------------------------------|--|--|--|--|--|----------------------|
| Tillage | None | Chemical fallow | No-till | Conventional | Conventional | No-till | No-till dryland and BView; and till irri | No-till | No-till |
| Soil Type | Bozeman silt loam | Clay loam | Loam | Creston silt loam | Williams clay loam | Hilton clay loam for pea and Telstad clay loam for lentils | | Judith clay | |
| Elevation (ft) | 4775 | 3700 | 3596 | 2900 | 2200 | 2718 | | 4250 | 2950 |
| Pea Trials | | | | | | | | | |
| Dates: | | | | | | | | | |
| Seeding | Apr. 30 | Apr. 5 | Pea not planted | May 11 | Apr. 15 dry and Apr. 18 irri. | Apr. 6 | April 7, 18 and 19 for B.view, dryland and irri., respectively. | April. 19 | Apr. 26 |
| Harvest | Aug. 4 | Different based on cultivars Jul. 16-23 | | Aug. 19 | July 21 dry and July 25 irri. | July 11 | Jul 20, 24 and 25 for dryland; B.view, and irri. respectively. | Jul 25 | Aug. 7 |
| Previous crop | Fallow | Chem fallow | | Winter wheat | Spring wheat dryland. and sugarbeet irri | Winter wheat-chem fallow | Barley for irri. and fallow for dryland and spring wheat for BView | Barley | Chemical fallow |
| Fertilizer | None | 11-20-20 N-P-Klbs/ac | | 6-30-40 | | None | None | None | None |
| Herbicides and insecticide | Sharpen 1oz/Acre; 1.5 pt/acre Prowl; 1 qt/acre Roundup | 3 oz/ac Spartan and 32 oz/ac RT3 preplant | | Triflurex (preplant and incorporated) and Warrior II @ June 6/2017 | Prowl H2O, roundup and outlook | Prowl H2O; 2 pt/ac and Mustang Maxx, 4 oz/ac | Prowl 2 pint/a and outlook 16 oz/a for dryland and irri | Roundup (1.25 pt/ac) preplant; Assure II (10 oz/ac), Raptor (4 oz/ac), Basagran (1.6 pt/ac) and Grizzly(1.5 oz/ac) all postplant | Roundup and ProwlH2O |
| Lentil Trials | | | | | | | | | |
| Dates: | | | | | | | | | |
| Seeding | Apr. 30 | Apr. 5 | Apr. 26 | May 11 | Apr. 15 dry and Apr. 18 irri. | Apr. 7 | April. 18 irr and Apr 19 dryland | Apr. 19 | Apr. 26 |

| | Bozeman (LRES) | Conrad (WTARC) | Corvallis (WARC) Irri. | Creston (NWARC) | Sidney dry and Irri. (EARC) | Havre (NARC) | Huntley (SARC) dryland, irr and Broadview | Moccasin (CARC) | Richland |
|----------------------------------|--|---|-----------------------------------|---|--|---|--|---|--------------------|
| Harvest | Aug. 9 | Aug.3 | Aug. 16 | Sep. 11 | Jul 4 dry and Jul 31 irri. | Jul. 18 | Aug. 17 irri and Aug. 20 Dryland | Jul. 26 | Aug. 8 |
| Previous crop | Fallow | Chem fallow | Barley | Winter wheat | Same as pea | Winter wheat | Barley irri and fallow dryland | Barley | Chemical fallow |
| Fertilizer | None | 11-20-20 N-P-Klbs/ac | None | 6-30-40 | | None | None | None | |
| Herbicides and insecticide | 1 oz/Acre Sharpen; 1.5 pints/acre Prowl; 1 qt/acre Roundup | 2 oz/ac Sharpen and 32 oz/ac RT3 | Prowl H2O, 32 oz/acre | Triflurex (preplant and incorporated) and Warrior II @ June 6/2017 | Same as pea | Prowl H2O; 2 pt/ac and Mustang Maxx, 4 oz/ac | Prowl 2 pint/a and outlook 16 oz/a for dryland and irri | Roundup (1.25 pt/ac) preplant and Sencor 4 (8oz/ac) psotplant | Same as pea |
| Chickpea Trials | | | | | | | | | |
| Dates: | | | | | | | | | |
| Seeding | Apr. 30 | Apr. 19 | Apr. 26 | Not planted | Apr. 15 dry and Apr. 18 irri. | Not planted | April. 18 irr and Apr 19 dryland | May 5 | Apr. 26 |
| Harvest | Aug. 17 | Aug. 30 | Aug. 16 | | Aug. 23 dryland and Aug. 18irri. | Not Applicable | Aug 11 dryland and Aug 17 irri | Aug. 16 | Aug. 21 |
| Previous | Fallow | Chem fallow | Wheat/barley | | Same as pea | Not Applicable | Fallow for dryland and barely for irri. | Barley | Chem fallow |
| Fertilizer | None | 11-20-20 N-P-Klbs/ac | None | | Same as pea | Not Applicable | None | None | None |
| Herbicides and insecticide | 1 oz/Acre Sharpen; 1.5 pints/acre Prowl; 1 qt/acre Roundup | 1 oz/ac Sharpen and 32 oz/ac RT3 | Prowl H2O, 32 oz/acre | | Same as pea | Not Applicable | Prowl 2 pint/a and outlook 16 oz/a for dryland and irri | Roundup (1.25 pt/ac) preplant and no post plant | Same as pea |

RESULTS

The results presented in this report include from Statewide dry pea, lentil and chickpea variety evaluation trials. First, results from dry pea (yellow and green) are presented followed by lentil and chickpea. Unusual dry growing season resulted in low yield in some of the locations such as Sidney dryland and Richland. But the yield at Huntley dryland was relatively good due to stored soil moisture during previous fallow period. The deer grazed the chickpea plots at Moccasin site resulting very low grain yield. In some cases, some varieties yield almost nil. But the cultivar Myles resulted in better grain yield than other cultivars at this location and may indicate that the deer may have preference in grazing the chickpea. At Richland site, there was deer damage to lentil and chickpea variety trials as well since crops were the only green during late in the growing season. With this brief introduction, the results are presented as follows.

Dry Pea

Statewide Dry Pea Variety Evaluation in 2017

A total of 56 dry pea varieties (34 yellow and 22 green) (both commercial varieties and experimental lines) were evaluated in 2017 at 11 sites (Bozeman, Broadview, Conrad, Creston, Havre, Huntley dryland, Huntley irrigated, Moccasin, Richland, Sidney dryland and Sidney irrigated) across Montana State. Some varieties submitted by private companies on a fee basis were tested at select locations only. Therefore, the number of varieties varied per site depends on the interest of the seed companies and breeders. Two of these sites (Huntley and Sidney) were irrigated. Some varieties from the pea line advancement trial were included in the statewide pea variety trial. The most common data collected and presented include grain yield, thousand kernel weight, test weight, plant height and number of days to flowering. However, only grain yield (bottom line) was consistently collected in the different testing sites. We suggest other researchers to strictly follow the research protocol while collecting data to make it easier for comparison of varieties across environments for the different parameters. The dry pea results are reported into two groups based on cotyledon color (yellow and green) as follows.

Yellow dry pea grain yield

The yellow dry pea grain yield varied greatly from site to site due to probably differences in environmental conditions and management practices. Mean grain yield for yellow dry pea for the different locations ranged from 306 lb/ac at Sidney dry land to 5804 lb/ac at Creston (Table 6). The extremely low yields recorded at Sidney

dryland was due to low moisture stress at this location. Application of supplemental irrigation at this site increased the mean yield from 306 lb/ac to 3220 lb/ac (Sidney irrigated site). Average yellow dry pea yields were 2175 lb/ac at Bozeman, 899 lb/ac at Broadview, 2569 lb/ac at Conrad, 5804 lb/ac at Creston, 1330 lb/ac at Havre, 1719 lb/ac Huntley (dryland), 3441 lb/ac Huntley irrigated, 952 lb/ac at Moccasin, 1006 lb/ac at Richland, 306 lb/ac Sidney dryland and 3220 lb/ac at Sidney irrigated (Table 6). The grain yields from irrigated sites (Huntley and Sidney) were substantially higher than yields from their respective dryland sites. This demonstrated the possibility to increase grain yield of pea with supplemental irrigation. The grain yield differences among varieties were statistically significant in most of the different sites. The grain yield at Creston was substantially higher than any other sites and was consistent for all varieties tested.

Yellow dry pea thousand kernel weight (TKW)

In 2017, only few testing sites recorded TKW and difficult to make conclusion. From the collected information, the highest TKW was recorded from Havre site (249 g /1000 seeds) and the lowest (166 g/1000 seeds) was from Moccasin (Table 7).

Yellow dry pea test weight

Test weight data were recorded in most of the sites as shown in Table 8. The mean test weigh ranging from 61.56 lb/bu to 66.01 lb/bu. The lowest mean test weight was recorded at Havre (61.56 lb/bu) and the maximum (66.01 lb/bu) was recorded at Moccasin site (Table 8). The difference in test weight was significant for the different varieties.

Yellow dry pea plant height

The mean plant height ranged from 30 cm to 105 cm. The lowest mean plant height was recorded from Sidney dryland site due to low soil moisture stress and the highest was recorded from Creston site (Table 9). Those varieties that are tall and upright are important for harvesting. In addition, they produce more residue that will be left in the field after harvest. This will have substantial contribution to improve soil health in the long run.

Yellow dry pea days to flowering

The number of days to flowering data were recorded for most of the locations. From those locations, the mean number of days to flowering was longer at Conrad and Huntley Dryland and was shorter at Havre than other sites (Table 10). The number of days to flowering ranging from 32 to 68 days (Table 10).

Green dry pea grain yield

Some characteristics of the green pea varieties are shown in Table 11. The mean grain yield for green pea ranging from 220 lb/ac to 5135 lb/ac. The average yields for green pea were 2080 lb/ac at Bozeman, 865 lb/ac at Broadview, 2425 lb/ac at Conrad, 5135 lb/ac at Creston, 1288 lb/ac at Havre, 1524 lb/ac at Huntley (dryland), 2930 lb/ac at Huntley (irrigated), 863 lb/ac at Moccasin, 935 lb/ac at Richland, 264 lb/ac at Sidney dryland and 2762 at Sidney with irrigation (Table 12). The mean grain yield both for green and yellow pea was higher at Creston site than other locations. The grain yield differences among varieties were significant for all locations except at Broadview, Huntley irrigated and Conrad.

Green dry pea thousand kernel weight (TKW)

The TKW data for green pea was recorded only for few sites and ranged from 157 gm per 1000 seeds to 230 gm per 1000 seeds (Table 13). The differences in TKW for the different varieties within a location were significant at all locations.

Green dry pea test weight

The mean test weight for green pea ranging from 61.26 lb/bu to 65.49 lb/bu (Table 14). The range in mean test weight for green dry pea at the different locations were narrow compared with yellow dry pea.

Green dry pea plant height

The mean plant height ranging from 27 cm to 96 cm (Table 15). Similar to yellow pea, the mean green pea plant height was shorter at Sidney dryland site and taller at Creston than other locations.

Green dry pea days to flowering

The mean number of days to flower ranging from 47 days to 69 days (Table 16). The mean number of day for flowering was shorter at Moccasin and longer at Conrad and Huntley Dryland. Early flowering of dry yellow pea (to the extent of 32 vs 47 days) compared with green dry pea could be one of the reason for higher mean grain yield for yellow dry pea to escape the low moisture and heat stresses during flowering time.

Summary

In 2017, the mean grain yields both for yellow and green pea varieties were higher at Creston than other sites. Compared to all yellow pea varieties, the maximum mean grain yield (6465 lb/ac) was recorded from variety Nette 2010 at Creston. This cultivar also resulted in the maximum yield for this location in 2016. Similarly, the

green color variety Arcadia resulted in maximum grain yield (5935 lb/ac) at Creston compared with other green color varieties. We found significant yield differences among varieties at several locations (Tables 6 and 12). On average, yellow dry pea varieties yielded 11% more grain yield than green dry pea. Several varieties have performed well in certain sites. However, none of the varieties consistently out yielded in all sites. In other words, the variety that resulted in maximum mean grain yield varied from location to location. This might suggest the importance of considering the release of site specific variety, due to the diverse ecologies of Montana, for better agronomic performances and economic returns.

Table 5. Yellow Dry Pea Variety Sources and Characteristics

| Variety* | Size | Maturity | Height | Breeding Program | Release Date |
|--------------|------|----------|--------|------------------|--------------|
| AC Agassiz | M | Late | Mod | AC | 2007 |
| Bridger | M | Mod | Mod | LL | 2011 |
| CDC Treasure | M | | Tall | CDC | 2009 |
| Delta | M | Mod | Short | | 1995 |
| DS Admiral | L | Mod | Tall | | 2000 |
| Jetset | L | Late | Mod | | |
| Korando | L | Late | Mod | | |
| Montech 4152 | ML | Mod | Tall | LIMG | 2009 |
| Montech 4193 | M | Mod | Mod | LIMG | |
| Mystique | L | Late | Mod | | |
| Navarro | VL | Early | Mod | | |
| Pro 127-2 | M | Mod | Mod | PG | |
| Pro 793 | VL | Early | Short | PG | |
| Spider | L | Mod | Tall | LL | 2008 |
| SW Midas | M | Mod | Mod | SW | 2004 |
| Trapeze | VL | Late | Short | SW | 2010 |

CDC = Crop Development Centre, University of Saskatchewan; AC = Agriculture Canada; LL = Legume Logic; PG = ProGene Plant Research; LIMG = Limagrain, Nederland; SW = Svalöf-Weibull. *Because some of the breeding varieties have not been registered and released as varieties and lack of information for other varieties, this table does not contain complete information for all varieties tested due to shortage of information.

Table 6. Montana Statewide Yellow Dry Pea Variety Evaluation–Grain Yield (lb/ac) in 2017. *Data from Bozeman was not adjusted to 13% moisture content.

| Yellow pea variety/line | Bozeman* | Broadview | Conrad | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri.) |
|-------------------------|-------------|-------------|-------------|-------------|-------------|---------------|-----------------|-------------|-------------|--------------|----------------|
| AAC Carver | | | | | 1462 | | | 824 | 1077 | 413 | 3056 |
| AAC Lacombe | | | | | 1621 | | | | 1064 | 321 | 3205 |
| AC Earlystar | | | | | 1571 | | | 911 | 1027 | 307 | 3477 |
| Bridger | | | 2534 | | 892 | | | | 863 | | |
| CDC Amarillo | | | | | 1318 | | | 746 | 960 | 319 | 3026 |
| CDC Inca | | | | | 1106 | | | 991 | 972 | 307 | 2414 |
| CDC Meadow | | | | | 1273 | | | 949 | 971 | 286 | 2752 |
| CDC Saffron | | | | | 1297 | | | 988 | 932 | 214 | 3084 |
| CDC Treasure | | | | | 1382 | | | 1083 | 495 | 270 | 3199 |
| DS Admiral | 2159 | 880 | 2460 | 5793 | 1516 | 1752 | 3521 | 1155 | 1004 | 376 | 3268 |
| Delta | 2243 | 823 | 2592 | 5865 | 1322 | 1542 | 3447 | 796 | 911 | 405 | 3524 |
| Durwood | | 957 | 2469 | | 1424 | 1693 | 3352 | | 1291 | 395 | 3310 |
| Gunner | | | 2463 | | 1515 | | | | 992 | | |
| Hyline | | | 2605 | | 1499 | | | | 1108 | | |
| Jetset | 2223 | 819 | 2436 | 6266 | 1093 | 1831 | 3273 | 1223 | 1006 | 306 | 3563 |
| Korando | | 879 | 2595 | | 1220 | 1865 | 3836 | | 1078 | 365 | 4011 |
| LL 5053 | | | | | | | | | 1023 | | |
| LL 5996 | | | | | | | | | 1029 | | |
| LL 66 | | | | | | | | | 1127 | | |
| Majestic | | | | | | | | | 1169 | | |
| Mystique | | | | | | | | | 1059 | 247 | 2838 |
| Navarro | 2126 | 875 | 2901 | 6024 | 1392 | 1806 | 3438 | 612 | 1200 | 244 | 3436 |
| Nette 2010 | 2212 | 1094 | 2972 | 6465 | 1411 | 1782 | 3561 | 1155 | 1177 | 235 | 3702 |
| PSO826MT460 | 2133 | 878 | 2386 | 5124 | 1348 | 1680 | 3254 | 1058 | 901 | 238 | 2599 |
| PSO826MT492 | 2168 | 911 | 2471 | 5999 | 1303 | 1689 | 3804 | 891 | 1047 | 298 | 3527 |
| PSO877MT632 | 2145 | 874 | 2369 | 4875 | 1308 | 1556 | 2930 | 893 | 1122 | 304 | 3021 |
| Pro 093-7410 | | | 2567 | | 1228 | 1711 | | | 1037 | | |
| Pro 133-6243 | | | 2790 | | 1485 | | | | 890 | | |
| Pro 143-6236 | | | | | | | | | 1055 | | |
| Pro 822 | | | | | | | 1728 | | | | |
| SW Marquee | | | | | | | | | 709 | | |
| Salamanca | | | 2749 | | 1642 | | | | 1172 | 264 | 3396 |
| Spider | | | 2328 | | 997 | | | | 719 | | |
| Universal Yellow | | | | 5828 | | | | | | | |
| Mean | 2175 | 899 | 2569 | 5804 | 1330 | 1719 | 3441 | 952 | 1006 | 306 | 3220 |
| P-Value | 0.8356 | 0.2690 | 0.6029 | <0.0001 | <0.0001 | 0.0469 | 0.1252 | 0.0008 | <0.0001 | 0.0030 | <0.0001 |
| LSD (0.05) | NS | NS | NS | 470 | 182 | 195 | NS | 257 | 263 | 101 | 526 |
| CV (%) | 5.81 | 15.22 | 15.45 | 5.55 | 9.69 | 7.90 | 11.72 | 18.96 | 18.68 | 19.96 | 9.89 |

Table 7. Montana Statewide Yellow Dry Pea Variety Evaluation –Thousand Kernel Weight (g) in 2017

| Yellow pea variety/line | Bozeman | Broadview | Conrad | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri.) |
|-------------------------|------------|-----------|------------|------------|------------|---------------|-----------------|------------|------------|--------------|----------------|
| AAC Carver | | | | | 236 | | | 160 | 212 | 215 | 240 |
| AAC Lacombe | | | | | 259 | | | | 242 | 252 | 287 |
| AC Earlystar | | | | | 226 | | | 152 | 208 | 202 | 202 |
| Bridger | | | 213 | | 239 | | | | 190 | | |
| CDC Amarillo | | | | | 215 | | | 163 | 207 | 213 | 226 |
| CDC Inca | | | | | 225 | | | 151 | 196 | 210 | 223 |
| CDC Meadow | | | | | 211 | | | 152 | 190 | 207 | 204 |
| CDC Saffron | | | | | 220 | | | 145 | 192 | 212 | 208 |
| CDC Treasure | | | | | 225 | | | 162 | 200 | 217 | 215 |
| DS Admiral | 200 | | 217 | 212 | 253 | | | 187 | 217 | 229 | 216 |
| Delta | 208 | | 230 | 220 | 253 | | | 158 | 208 | 236 | 232 |
| Durwood | | | 210 | | 246 | | | | 214 | 237 | 239 |
| Gunner | | | 214 | | 254 | | | | 229 | | |
| Hyline | | | 229 | | 254 | | | | 222 | | |
| Jetset | 217 | | 218 | 212 | 239 | | | 174 | 204 | 228 | 257 |
| Korando | | | 228 | | 285 | | | | 227 | 275 | 274 |
| LL 5053 | | | | | | | | | 206 | | |
| LL 5996 | | | | | | | | | 234 | | |
| LL 66 | | | | | | | | | 199 | | |
| Majestic | | | | | | | | | 207 | | |
| Mystique | | | | | | | | | 217 | 236 | 246 |
| Navarro | 235 | | 250 | 234 | 300 | | | 194 | 224 | 249 | 247 |
| Nette 2010 | 214 | | 232 | 209 | 277 | | | 179 | 209 | 243 | 224 |
| PSO826MT460 | 221 | | 248 | 234 | 259 | | | 180 | 234 | 243 | 253 |
| PSO826MT492 | 215 | | 238 | 218 | 263 | | | 179 | 228 | 243 | 256 |
| PSO877MT632 | 205 | | 210 | 211 | 243 | | | 156 | 204 | 214 | 213 |
| Pro 093-7410 | | | 208 | | 235 | | | | 192 | | |
| Pro 133-6243 | | | 266 | | 310 | | | | 245 | | |
| Pro 143-6236 | | | | | | | | | 184 | | |
| Pro 822 | | | | | | | | | | | |
| SW Marquee | | | | | | | | | 174 | | |
| Salamanca | | | 231 | | 253 | | | | 218 | | |
| Spider | | | 216 | | 251 | | | | 218 | 229 | 257 |
| Universal Yellow | | | | 210 | | | | | | | |
| Mean | 214 | | 227 | 217 | 249 | | | 166 | 211 | 230 | 236 |
| P-Value | 0.0010 | | 0.0016 | 0.0021 | <0.0001 | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| LSD (0.05) | 13.3 | | 27.0 | 12.3 | 13.1 | | | 13.3 | 10.0 | 14.1 | 11.9 |
| CV (%) | 4.23 | | 8.36 | 4.02 | 3.70 | | | 5.62 | 3.38 | 3.72 | 3.04 |

Table 8. Montana Statewide Yellow Dry Pea Variety Evaluation – Test Weight (lb/bu) in 2017. *Sample amount was too small to measure test weight at Sidney dryland.

| Yellow pea variety/line | Bozeman | Broadview | Conrad | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry)* | Sidney (Irri.) |
|-------------------------|---------|--------------|--------------|--------------|--------------|---------------|-----------------|--------------|--------------|---------------|----------------|
| AAC Carver | | | | | 62.18 | | | 65.90 | 64.90 | | 64.77 |
| AAC Lacombe | | | | | 61.53 | | | | 64.68 | | 65.43 |
| AC Earlystar | | | | | 61.20 | | | 65.45 | 63.95 | | 64.47 |
| Bridger | | | 63.40 | | 62.13 | | | | 65.10 | | |
| CDC Amarillo | | | | | 62.25 | | | 65.73 | 63.83 | | 64.73 |
| CDC Inca | | | | | 61.73 | | | 65.78 | 64.58 | | 65.30 |
| CDC Meadow | | | | | 62.25 | | | 66.38 | 65.68 | | 65.77 |
| CDC Saffron | | | | | 61.80 | | | 66.83 | 65.18 | | 65.77 |
| CDC Treasure | | | | | 61.43 | | | 66.18 | 65.35 | | 65.27 |
| DS Admiral | | 65.33 | 62.40 | 62.60 | 60.10 | 65.25 | 65.50 | 64.70 | 63.60 | | 64.00 |
| Delta | | 65.60 | 63.08 | 63.65 | 62.00 | 66.80 | 66.43 | 66.93 | 65.18 | | 64.77 |
| Durwood | | 65.53 | 62.28 | | 61.35 | 65.40 | 65.90 | | 63.83 | | 64.10 |
| Gunner | | | 62.73 | | 61.48 | | | | 64.33 | | |
| Hyline | | | 63.40 | | 61.60 | | | | 64.68 | | |
| Jetset | | 64.43 | 62.18 | 62.95 | 60.55 | 65.68 | 65.93 | 65.30 | 64.18 | | 64.13 |
| Korando | | 65.80 | 63.38 | | 61.37 | 65.38 | 65.08 | | 64.08 | | 64.87 |
| LL 5053 | | | | | | | | | 66.28 | | |
| LL 5996 | | | | | | | | | 64.23 | | |
| LL 66 | | | | | | | | | 63.63 | | |
| Majestic | | | | | | | | | 64.65 | | |
| Mystique | | | | | | | | | 63.80 | | 64.40 |
| Navarro | | 65.75 | 62.98 | 63.25 | 61.40 | 65.70 | 65.65 | 65.98 | 63.75 | | 64.67 |
| Nette 2010 | | 65.88 | 63.23 | 64.98 | 61.35 | 66.60 | 66.45 | 66.58 | 65.35 | | 64.80 |
| PSO826MT460 | | 64.88 | 62.25 | 62.35 | 60.90 | 65.13 | 65.13 | 65.75 | 63.85 | | 63.97 |
| PSO826MT492 | | 66.25 | 64.23 | 63.60 | 61.95 | 65.85 | 66.00 | 66.55 | 63.78 | | 65.10 |
| PSO877MT632 | | 65.25 | 62.60 | 63.78 | 61.40 | 65.58 | 65.45 | 66.20 | 64.93 | | 64.83 |
| Pro 093-7410 | | | 63.10 | | 62.18 | 66.03 | | | 65.18 | | |
| Pro 133-6243 | | | 63.65 | | 61.80 | | | | 65.23 | | |
| Pro 143-6236 | | | | | | | | | 64.78 | | |
| Pro 822 | | | | | | 66.43 | | | | | |
| SW Marquee | | | | | | | | | 64.03 | | |
| Salamanca | | | 62.95 | | 61.33 | | | | 64.53 | | 64.80 |
| Spider | | | 63.20 | | 61.85 | | | | 64.18 | | |
| Universal Yellow | | | | 63.63 | | | | | | | |
| Mean | | 65.47 | 63.00 | 63.41 | 61.56 | 65.81 | 65.75 | 66.01 | 64.53 | | 64.79 |
| P-Value | | 0.0006 | <0.0001 | 0.00060 | <0.0001 | <0.0001 | 0.0035 | <0.0001 | <0.0001 | | <0.0001 |
| LSD (0.05) | | 0.68 | 0.62 | 0.96 | 0.65 | 0.55 | 0.71 | 0.46 | 0.63 | | 0.55 |
| CV (%) | | 0.72 | 0.69 | 1.04 | 0.75 | 0.58 | 0.75 | 0.49 | 0.70 | | 0.52 |

Table 9. Montana Statewide Yellow Dry Pea Evaluation – Plant Height (cm) in 2017

| Yellow pea variety/line | Bozeman | Broadview | Conrad | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri.) |
|-------------------------|-----------|-----------|-----------|------------|-----------|---------------|-----------------|-----------|-----------|--------------|----------------|
| AAC Carver | | | | | 40 | | | 53 | 38 | 36 | 69 |
| AAC Lacombe | | | | | 45 | | | | 42 | 30 | 78 |
| AC Earlystar | | | | | 39 | | | 54 | 38 | 32 | 66 |
| Bridger | | | 17 | | 32 | | | | 35 | 36 | |
| CDC Amarillo | | | | | 47 | | | 50 | 42 | 28 | 76 |
| CDC Inca | | | | | 42 | | | 54 | 42 | 35 | 78 |
| CDC Meadow | | | | | 41 | | | 54 | 33 | 35 | 73 |
| CDC Saffron | | | | | 38 | | | 53 | 33 | 26 | 61 |
| CDC Treasure | | | | | 44 | | | 59 | 42 | 38 | 69 |
| DS Admiral | 60 | 43 | 19 | 113 | 38 | 55 | 85 | 55 | 40 | 28 | 68 |
| Delta | 50 | 37 | 16 | 100 | 32 | 54 | 77 | 41 | 28 | 27 | 61 |
| Durwood | | 42 | 20 | | 41 | 56 | 74 | | 42 | 33 | 77 |
| Gunner | | | 23 | | 42 | | | | 31 | | |
| Hyline | | | 20 | | 32 | | | | 33 | | |
| Jetset | 58 | 42 | 18 | 105 | 36 | 63 | 78 | 52 | 40 | 31 | 72 |
| Korando | | 35 | 18 | | 34 | 53 | 82 | | 33 | 28 | 63 |
| LL 5053 | | | | | | | | | 36 | | |
| LL 5996 | | | | | | | | | 37 | | |
| LL 66 | | | | | | | | | 40 | | |
| Majestic | | | | | | | | | 45 | | |
| Mystique | | | | | | | | | 34 | 28 | 81 |
| Navarro | | 36 | 18 | 96 | 32 | 51 | 80 | 47 | 37 | 27 | 66 |
| Nette 2010 | 56 | 34 | 19 | 110 | 38 | 55 | 68 | 53 | 31 | 28 | 70 |
| PSO826MT460 | 48 | 30 | 19 | 87 | 38 | 51 | 72 | 47 | 34 | 22 | 45 |
| PSO826MT492 | 61 | 37 | 23 | 114 | 39 | 52 | 78 | 51 | 37 | 25 | 62 |
| PSO877MT632 | 42 | 39 | 16 | 107 | 38 | 54 | 70 | 49 | 42 | 28 | 58 |
| Pro 093-7410 | | | 15 | | 32 | 53 | | | 35 | | |
| Pro 133-6243 | | | 16 | | 35 | | | | 31 | | |
| Pro 143-6236 | | | | | | | | | 32 | | |
| Pro 822 | | | | | | 56 | | | | | |
| SW Marquee | | | | | | | | | 38 | | |
| Salamanca | | | 21 | | | | | | 43 | | 79 |
| Spider | | | 23 | | 40 | | | | 39 | 32 | |
| Universal Yellow | | | | 102 | 44 | | | | | | |
| Mean | 53 | 37 | 19 | 105 | 38 | 54 | 76 | 51 | 37 | 30 | 69 |
| P-Value | 0.0002 | 0.0049 | 0.0076 | 0.0050 | <0.0001 | 0.0984 | 0.2263 | <0.0001 | 0.0017 | 0.0033 | <0.0001 |
| LSD (0.05) | 7.0 | 6.3 | 4.6 | 9.2 | 5.2 | NS | NS | 5.8 | 8.3 | 6.9 | 12.3 |
| CV (%) | 8.91 | 11.71 | 17.34 | 6.17 | 9.72 | 8.84 | 11.46 | 7.94 | 16.11 | 13.98 | 10.86 |

Table 10. Montana Statewide Yellow Dry Pea Variety Evaluation – Number of Days to Flowering in 2017

| Yellow pea variety/line | Bozeman | Broadview | Conrad | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri.) |
|-------------------------|-----------|-----------|-----------|-----------|-----------|---------------|-----------------|-----------|----------|--------------|----------------|
| AAC Carver | | | | | 40 | | | 61 | | 63 | 62 |
| AAC Lacombe | | | | | 45 | | | | | 64 | 63 |
| AC Earlystar | | | | | 39 | | | 63 | | 60 | 59 |
| Bridger | | | 69 | | 32 | | | | | | |
| CDC Amarillo | | | | | 47 | | | 64 | | 64 | 65 |
| CDC Inca | | | | | 42 | | | 65 | | 63 | 69 |
| CDC Meadow | | | | | 41 | | | 64 | | 62 | 60 |
| CDC Saffron | | | | | 38 | | | 63 | | 60 | 59 |
| CDC Treasure | | | | | 44 | | | 62 | | 60 | 60 |
| DS Admiral | 58 | | 69 | 53 | 38 | 68 | 58 | 64 | | 60 | 58 |
| Delta | 57 | | 68 | 54 | 32 | 68 | 58 | 63 | | 59 | 57 |
| Durwood | | | 68 | | 41 | 68 | 58 | | | 61 | 60 |
| Gunner | | | 69 | | 42 | | | | | | |
| Hyline | | | 70 | | 32 | | | | | | |
| Jetset | 58 | | 69 | 54 | 36 | 69 | 57 | 63 | | 62 | 60 |
| Korando | | | 66 | | 34 | 65 | 58 | | | 55 | 54 |
| LL 5053 | | | | | | | | | | | |
| LL 5996 | | | | | | | | | | | |
| LL 66 | | | | | | | | | | | |
| Majestic | | | | | | | | | | | |
| Mystique | | | | | | | | | | 62 | 63 |
| Navarro | 54 | | 66 | 48 | 32 | 65 | 58 | 58 | | 55 | 54 |
| Nette 2010 | 56 | | 68 | 53 | 38 | 67 | 58 | 61 | | 57 | 57 |
| PSO826MT460 | 57 | | 69 | 51 | 38 | 67 | 58 | 62 | | 59 | 56 |
| PSO826MT492 | 56 | | 68 | 51 | 39 | 68 | 58 | 60 | | 56 | 56 |
| PSO877MT632 | 58 | | 69 | 54 | 38 | 68 | 57 | 63 | | 60 | 59 |
| Pro 093-7410 | | | 66 | | 32 | 68 | | | | | |
| Pro 133-6243 | | | 67 | | 35 | | | | | | |
| Pro 143-6236 | | | | | | | | | | | |
| Pro 822 | | | | | | 65 | | | | | |
| SW Marquee | | | | | | | | | | | |
| Salamanca | | | 70 | | 40 | | | | | 58 | 60 |
| Spider | | | 70 | | 44 | | | | | | |
| Universal Yellow | | | | 51 | | | | | | | |
| Mean | 57 | | 68 | 52 | 38 | 67 | 58 | 62 | | 60 | 60 |
| P-Value | <0.0001 | | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.9931 | <0.0001 | | <0.0001 | <0.0001 |
| LSD (0.05) | 1.3 | | 1.81 | 1.1 | 5.2 | 1.3 | NS | 1.9 | | 2.7 | 1.8 |
| CV (%) | 1.55 | | 1.86 | 1.47 | 9.72 | 1.32 | 3.85 | 2.19 | | 2.72 | 1.81 |

Table 11. Green dry pea variety sources and characteristics

| Variety* | Size | Maturity | Height | Breeding | Release |
|-------------|------|----------|--------|----------|---------|
| Aragorn | M | Mod | Mod | PG | 2006 |
| Arcadia | M | Mod | Short | | 2009 |
| Banner | M | Early | Tall | PG | 2007 |
| Bluemoon | VL | Late | Short | | |
| CDC Striker | L | Mod | Mod | CDC | 2002 |
| Cruiser | S | Mod | Tall | PG | 2002 |
| Daytona | VL | Late | Short | | |
| K2 | M | Mod | Mod | LL | 2005 |
| Majoret | M | Mod | Short | SW | 1994 |
| PS07ND0190 | M | Late | Tall | NDSU | |
| Viper | L | Late | Mod | | |

PG = ProGene Plant Research; CDC = Crop Development Centre, University of Saskatchewan; LL = Legume Logic; NDSU = North Dakota State University; LIMG = LImagrain, Netherlands; SW = Svalöf-Weibull.

*Because some of the breeding varieties have not been registered and released as varieties and lack of information for other varieties, this table does not contain complete information for all varieties tested thus not inclusive.

Table 12. Montana Statewide Green Dry Pea Variety Evaluation – Grain Yield (lb/ac) in 2017. Data from Bozeman is not adjusted to 13% moisture.

| Green pea variety/line | Bozeman | Broadview | Conrad | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri.) |
|------------------------|-------------|------------|-------------|-------------|-------------|---------------|-----------------|-------------|-------------|--------------|----------------|
| Aragorn | 1860 | 784 | 2180 | 5249 | 1358 | 1561 | 3013 | 786 | 782 | 199 | 3017 |
| Arcadia | 2078 | 907 | 2257 | 5935 | 1174 | 1663 | 2911 | 876 | 669 | 280 | 3118 |
| Banner | | | 2481 | | 1285 | | | | | | |
| Bluemoon | | | | | | | | | 911 | | |
| CDC Greenwater | | | | | 1213 | | | 764 | 1024 | 218 | 2562 |
| CDC Patrick | | | | | 995 | | | 656 | 668 | 180 | 2378 |
| CDC Raezer | | | | | 1047 | | | 1150 | 688 | 377 | 2427 |
| Ginny | | | 2640 | | 1601 | | | | 907 | | |
| Greenwood | | | 2251 | | 1274 | | | | | | |
| Hampton | 2297 | 920 | 2665 | 5365 | 1532 | 1433 | 3113 | 636 | 1062 | 242 | 2982 |
| LL 7647 | | | | | | | | | 1177 | | |
| LG Koda (LN1123) | 2260 | | 2660 | | 1510 | | | | 1122 | 352 | 1909 |
| Majoret | 2048 | 673 | 2065 | 5185 | 1220 | 1324 | 3042 | 839 | 744 | 236 | 2992 |
| PSO877MT457 | 1984 | 814 | 2471 | 5056 | 1172 | 1898 | 3116 | 1098 | 1099 | 318 | 3405 |
| PSO826MT190 | 2090 | 920 | 2707 | 5106 | 1303 | 1440 | 2839 | 875 | 972 | 237 | 2411 |
| PSO877MT076 | 2004 | 970 | 2093 | 3782 | 1378 | 1283 | 2930 | 957 | 1153 | 280 | 2424 |
| PSO877MT499 | 2076 | 939 | 2233 | 5493 | 1211 | 1559 | 2484 | 864 | 818 | 288 | 2445 |
| Pro 121-7126 | | | 2556 | | 1581 | | | | 956 | | |
| Pro-131-6221 | | | 2410 | | 1256 | | | | | | |
| Pro 131-7123 | | | 2743 | | 1619 | 1555 | | | 1070 | | |
| Shamrock | | | | | | | | | 1018 | | |
| Viper | 2113 | | 2456 | | 1112 | | | | 942 | 220 | 3837 |
| Mean | 2080 | 865 | 2425 | 5135 | 1288 | 1524 | 2930 | 863 | 935 | 264 | 2762 |
| P-value | 0.0011 | 0.1806 | 0.4019 | <0.0001 | <0.0001 | 0.0002 | 0.6102 | 0.0065 | 0.0001 | 0.0023 | <0.0001 |
| LSD (0.05) | 173 | NS | NS | 432 | 163 | 215 | NS | 259 | 245 | 87 | 574 |
| CV (%) | 5.75 | 18.14 | 18.13 | 5.95 | 8.92 | 9.69 | 15.86 | 20.84 | 18.47 | 19.69 | 12.33 |

Table 13. Montana Statewide Green Dry Pea Variety Evaluation – Thousand Kernel Weight (TKW in g) in 2017

| Green pea variety/line | Bozeman | Broadview | Conrad | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri.) |
|------------------------|------------|-----------|------------|------------|------------|---------------|-----------------|------------|------------|--------------|----------------|
| Aragorn | 191 | | 211 | 192 | 231 | | | 147 | 188 | 205 | 188 |
| Arcadia | 186 | | 187 | 182 | 221 | | | 133 | 181 | 214 | 214 |
| Banner | | | 204 | | 234 | | | | | | |
| Bluemoon | | | | | | | | | 225 | | |
| CDC Greenwater | | | | | 223 | | | 161 | 207 | 217 | 232 |
| CDC Patrick | | | | | 177 | | | 138 | 192 | 189 | 180 |
| CDC Raezer | | | | | 232 | | | 178 | 210 | 224 | 227 |
| Ginny | | | 198 | | 224 | | | | 198 | | |
| Greenwood | | | 201 | | 232 | | | | | | |
| Hampton | 197 | | 236 | 209 | 239 | | | 153 | 206 | 231 | 204 |
| LL 7647 | | | | | | | | | 197 | | |
| LG Koda (LN1123) | 204 | | 216 | | 244 | | | | 207 | 224 | 224 |
| Majoret | 210 | | 226 | 217 | 238 | | | 165 | 202 | 221 | 228 |
| PSO877MT457 | 208 | | 242 | 222 | 254 | | | 176 | 214 | 241 | 228 |
| PSO826MT190 | 201 | | 204 | 180 | 224 | | | 157 | 207 | 199 | 198 |
| PSO877MT076 | 191 | | 208 | 189 | 214 | | | 152 | 198 | 217 | 175 |
| PSO877MT499 | 209 | | 231 | 211 | 253 | | | 170 | 202 | 223 | 202 |
| Pro 121-7126 | | | 218 | | 237 | | | | 204 | | |
| Pro 131-6221 | | | 205 | | 228 | | | | | | |
| Pro 131-7123 | | | 189 | | 204 | | | | 158 | | |
| Shamrock | | | | | | | | | 194 | | |
| Viper | 210 | | 229 | | 271 | | | | 202 | 238 | 216 |
| Mean | 200 | | 212 | 200 | 230 | | | 157 | 200 | 219 | 209 |
| P-value | 0.0008 | | <0.0001 | <0.0001 | <0.0001 | | | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| LSD (0.05) | 12.0 | | 17.3 | 10.2 | 6.9 | | | 11.4 | 11.1 | 10 | 11.8 |
| CV (%) | 4.14 | | 5.76 | 3.47 | 2.12 | | | 5.03 | 3.94 | 2.74 | 3.36 |

Table 14. Montana Statewide Green Dry Pea Variety Evaluation – Test Weight (lb/bu) in 2017. *Samples were too small to measure test wt at Sidney dry site.

| Green pea variety/line | Bozeman | Broadview | Conrad | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry)* | Sidney (Irri.) |
|------------------------|---------|--------------|--------------|--------------|--------------|---------------|-----------------|--------------|--------------|---------------|----------------|
| Aragorn | | 64.20 | 61.35 | 62.38 | 60.25 | 65.15 | 64.85 | 64.80 | 63.63 | | 63.67 |
| Arcadia | | 65.18 | 62.43 | 62.70 | 61.48 | 65.98 | 66.08 | 65.85 | 64.58 | | 64.03 |
| Banner | | | 63.33 | | 62.03 | | | | | | |
| Bluemoon | | | | | | | | | 64.48 | | |
| CDC Greenwater | | | | | 61.68 | | | 64.78 | 63.80 | | 64.53 |
| CDC Patrick | | | | | 61.33 | | | 65.93 | 64.70 | | 65.63 |
| CDC Raezer | | | | | 61.48 | | | 65.58 | 64.55 | | 64.10 |
| Ginny | | | 63.00 | | 61.55 | | | | 65.18 | | |
| Greenwood | | | 63.13 | | 61.60 | | | | | | |
| Hampton | | 65.08 | 62.53 | 63.08 | 60.78 | 65.18 | 65.13 | 66.35 | 64.35 | | 64.07 |
| LL 7647 | | | | | | | | | 64.85 | | |
| LG Koda (LN1123) | | | 63.73 | | 61.68 | | | | 65.08 | | 64.27 |
| Majoret | | 65.53 | 63.25 | 63.33 | 61.55 | 65.13 | 65.75 | 65.78 | 64.50 | | 64.30 |
| PS0877MT457 | | 64.83 | 61.65 | 63.55 | 60.83 | 64.78 | 64.48 | 65.23 | 63.48 | | 63.13 |
| PSO826MT190 | | 65.08 | 61.93 | 63.25 | 61.00 | 64.95 | 65.13 | 64.83 | 64.13 | | 64.43 |
| PSO877MT076 | | 64.35 | 61.68 | 62.83 | 61.80 | 64.25 | 64.45 | 65.03 | 63.90 | | 63.87 |
| PSO877MT499 | | 65.58 | 62.80 | 63.83 | 61.28 | 65.63 | 65.33 | 66.28 | 64.68 | | 64.30 |
| Pro 121-7126 | | | 62.23 | | 61.15 | | | | 64.43 | | |
| Pro 131-6221 | | | 61.60 | | 61.38 | | | | | | |
| Pro 131-7123 | | | 61.13 | | 60.15 | 65.40 | | | 64.50 | | |
| Shamrock | | | | | | | | | 65.35 | | |
| Viper | | | 62.20 | | 60.98 | | | | 63.85 | | 62.93 |
| Mean | | 64.98 | 62.34 | 63.12 | 61.26 | 65.16 | 65.15 | 65.49 | 64.42 | | 64.10 |
| P-value | | 0.0038 | <0.0001 | 0.1222 | 0.0002 | 0.0002 | 0.0004 | 0.0001 | <0.0001 | | <0.0001 |
| LSD (0.05) | | 0.69 | 0.73 | NS | 0.76 | 0.57 | 0.66 | 0.48 | 0.62 | | 0.50 |
| CV (%) | | 0.73 | 0.83 | 1.09 | 0.87 | 0.60 | 0.69 | 0.51 | 0.67 | | 0.46 |

Table 15. Montana Statewide Green Dry Pea Variety Evaluation – Plant Height (cm) in 2017

| Green pea variety/line | Bozeman | Broadview | Conrad | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri.) |
|------------------------|-----------|-----------|-----------|------------|-----------|---------------|-----------------|-----------|-----------|--------------|----------------|
| Aragorn | 52 | 36 | 67 | 99 | 29 | 68 | 71 | 62 | 32 | 23 | 55 |
| Arcadia | 55 | 34 | 72 | 92 | 32 | 69 | 68 | 64 | 31 | 22 | 61 |
| Banner | | | 65 | | 36 | | | | | | |
| Bluemoon | | | | | | | | | 32 | | |
| CDC Greenwater | | | | | 43 | | | 66 | 39 | 27 | 86 |
| CDC Patrick | | | | | 40 | | | 68 | 36 | 29 | 51 |
| CDC Raezer | | | | | 40 | | | 65 | 37 | 33 | 58 |
| Ginny | | | 68 | | 34 | | | | 34 | | |
| Greenwood | | | 69 | | 32 | | | | | | |
| Hampton | 50 | 34 | 71 | 88 | 32 | 70 | 72 | 63 | 31 | 22 | 54 |
| LL 7647 | | | | | | | | | 45 | | |
| LG Koda (LN1123) | 62 | | 72 | | 34 | | | | 41 | 28 | 74 |
| Majoret | 59 | 38 | 70 | 97 | 35 | 70 | 73 | 64 | 38 | 27 | 71 |
| PSO877MT457 | 61 | 43 | 68 | 91 | 37 | 67 | 71 | 61 | 40 | 30 | 64 |
| PSO826MT190 | 65 | 45 | 72 | | 44 | 70 | 71 | 63 | 41 | 28 | 79 |
| PSO877MT076 | 48 | 46 | 70 | 96 | 38 | 68 | 72 | 63 | 35 | 29 | 54 |
| PSO877MT499 | 54 | 37 | 67 | 103 | 32 | 68 | 71 | 60 | 34 | 27 | 65 |
| Pro 121-7126 | | | 70 | | 31 | | | | 35 | | |
| Pro 131-6221 | | | 69 | | 29 | | | | | | |
| Pro 131-7123 | | | 70 | | 36 | 69 | | | 34 | | |
| Shamrock | | | | | | | | | 40 | | |
| Viper | 61 | | 67 | | | | | | 32 | 27 | 71 |
| Mean | 57 | 39 | 69 | 96 | 36 | 69 | 71 | 63 | 36 | 27 | 65 |
| P-value | 0.0002 | 0.1550 | <0.0001 | 0.3328 | 35 | <0.0001 | 0.9981 | <0.0001 | 0.0068 | 0.1180 | <0.0001 |
| LSD (0.05) | 6.9 | NS | 1.8 | NS | <0.0001 | 1.2 | NS | 2.6 | 7.2 | NS | 12.7 |
| CV (%) | 8.40 | 18.70 | 1.80 | 6.67 | 5.3 | 1.19 | 13.41 | 2.84 | 14.21 | 15.16 | 11.63 |

Table 16. Montana Statewide Green Dry Pea Variety Evaluation – Number of Days to Flowering in 2017

| Green pea variety/line | Bozeman | Broadview | Conrad | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri.) |
|------------------------|-----------|-----------|-------------|-----------|-----------|---------------|-----------------|-----------|----------|--------------|----------------|
| Aragorn | 58 | | 67 | 53 | 62 | 68 | 58 | 45 | | 59 | 60 |
| Arcadia | 58 | | 72 | 54 | 63 | 69 | 58 | 39 | | 61 | 61 |
| Banner | | | 65 | | 58 | | | | | | |
| Bluemoon | | | | | | | | | | | |
| CDC Greenwater | | | | | 65 | | | 45 | | 66 | 68 |
| CDC Patrick | | | | | 66 | | | 47 | | 64 | 70 |
| CDC Raezer | | | | | 64 | | | 52 | | 62 | 62 |
| Ginny | | | 68 | | 63 | | | | | | |
| Greenwood | | | 69 | | 62 | | | | | | |
| Hampton | 60 | | 71 | 56 | 64 | 70 | 58 | 39 | | 63 | 60 |
| LL 7647 | | | | | | | | | | | |
| LG Koda (LN1123) | 59 | | 72 | | 64 | | | | | 62 | 65 |
| Majoret | 60 | | 70 | 55 | 64 | 70 | 55 | 50 | | 62 | 61 |
| PS0877MT457 | 56 | | 68 | 52 | 59 | 67 | 59 | 54 | | 55 | 56 |
| PSO826MT190 | 61 | | 72 | 54 | 64 | 70 | 58 | 56 | | 62 | 66 |
| PSO877MT076 | 62 | | 70 | 54 | 62 | 68 | 57 | 45 | | 62 | 67 |
| PSO877MT499 | 57 | | 67 | 54 | 63 | 68 | 58 | 41 | | 56 | 57 |
| Pro 121-7126 | | | 70 | | 64 | | | | | | |
| Pro 121-6221 | | | 69 | | 62 | | | | | | |
| Pro 131-7123 | | | 70 | | 63 | 69 | | | | | |
| Shamrock | | | | | | | | | | | |
| Viper | 57 | | 67 | | 62 | | | | | 56 | 57 |
| Mean | 59 | | 69 | 54 | 63 | 69 | 57 | 47 | | 61 | 62 |
| P-value | <0.0001 | | <0.0001 | 0.0007 | <0.0001 | <0.0001 | 0.0661 | <0.0001 | | <0.0001 | <0.0001 |
| LSD (0.05) | 0.92 | | 1.8 | 1.3 | 0.8 | 1.2 | NS | 5.8 | | 3.4 | 1.6 |
| CV (%) | 1.08 | | 1.80 | 1.63 | 0.89 | 1.19 | 2.62 | 8.69 | | 3.35 | 1.53 |

Multi-Year and Multi-Location Statewide Dry Pea Variety Evaluation Summary

Multi-year (2010-2017) Summary:

The multi-year grain yield data for different varieties and locations are shown in Table 17. This information was intended to show the stability of varieties across years and locations. But one of the problem with this multi-year data is that every year variety entered for the trials changed and make it difficult for comparison purpose to calculate the mean for a variety across years. This is mainly due to the interest of seed suppliers to test their varieties changing every year in terms of submitting the varieties and selecting testing sites. However, this table may provide some information for those interested in the magnitude of yield change across years for only those few varieties submitted/repeated every year.

Table 17. Montana Statewide Dry Pea Variety Evaluation – 2010-2017 Multi-Year Grain Yield Summary (lb/ac)

| Varieties | Bozeman | | | | | | | | Conrad | | | | | | | |
|-------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------|-------------|-------------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Yellow Pea | | | | | | | | | | | | | | | | |
| AC Agassiz | | | 905 | 1857 | 2492 | 1384 | 2385 | | | 2867 | 2746 | 1519 | 2876 | | 3863 | |
| Bridger | | 2476 | 1085 | 1763 | 2464 | | 2191 | | | 3259 | 2793 | 1741 | 2212 | | 4223 | 2534 |
| Delta | 3118 | 2105 | 1011 | 1779 | | 1564 | 2265 | 2243 | 869 | 2832 | 2526 | 1641 | | | 3933 | 2592 |
| DS Admiral | 3439 | 2206 | 910 | 1910 | 2665 | 1569 | 2229 | 2159 | 1212 | 3070 | 2204 | 1638 | 2795 | | 3239 | 2460 |
| Montech 4152 | | 2378 | 1074 | 2019 | 2444 | | | | | 3066 | 3116 | 1862 | 3456 | | | |
| Spider | | 2188 | 1037 | 1971 | | | | | 1100 | 2664 | 2426 | 1748 | 3492 | | 4666 | 2328 |
| SW Midas | 3436 | 2382 | 1048 | 1780 | 2396 | | | | 1212 | 2774 | 2674 | 1846 | 3216 | | | |
| <i>Yellow Ave*</i> | 3277 | 2246 | 1008 | 1883 | 2452 | 1577 | 2320 | 2175 | 1181 | 2853 | 2745 | 1741 | 2723 | | 4039 | 2569 |
| Green Pea | | | | | | | | | | | | | | | | |
| Arcadia | | 2378 | 966 | 1978 | 2349 | 1101 | 2029 | 2078 | | 3178 | 2281 | 1718 | 3346 | | 4838 | 2257 |
| CDC Striker | 2585 | 2081 | 918 | 1502 | 2283 | 1385 | | | 1147 | 2632 | 2254 | 1812 | 2017 | | | |
| Cruiser | 3041 | 2152 | 872 | 1731 | 2101 | | 2001 | | 965 | 2746 | 2002 | 1488 | 2995 | | 2923 | |
| K2 | | 2018 | 962 | 1500 | | | | | 1304 | 2622 | 2246 | 1713 | 2619 | | | |
| Majoret | 3008 | 2039 | 961 | 1705 | 2255 | 1110 | 2067 | 2048 | 1623 | 2382 | 2407 | 1607 | 2469 | | 2367 | 2065 |
| Stirling | 3288 | 2184 | 1088 | | | | | | 926 | 2651 | 2746 | | | | | |
| <i>Green Ave*</i> | 2934 | 2123 | 961 | 1709 | 2312 | 1370 | 2162 | 2080 | 1164 | 2581 | 2373 | 1704 | 1177 | | 4003 | 2425 |
| Trial Mean [§] | 3145 | 2177 | 986 | 1811 | 2385 | 1504 | 2250 | 2123 | 1174 | 2702 | 2577 | 1734 | 2798 | | 4023 | 2500 |
| LSD (0.05)[§] | 639 | NS | 144 | NS | NS | 70 | 288 | 176 | 298 | NS | NS | 483 | NS | | 1110 | 596 |
| CV (%) [§] | 14 | 7 | 10 | 11 | 14 | 16 | 9.04 | 5.84 | 18 | 14 | 29 | 20 | 32 | | 19.51 | 16.87 |

*Average values brought from Tables 6 and 12 for yellow and green pea, respectively. [§]Indicate results when both green and yellow dry peas combined and analyzed together.

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Table 17. Statewide Dry Pea Variety Evaluations – 2010 – 2017 Multi-year Grain Yield Summary (lb/ac)...continued

| Varieties | Corvallis | | | | | | | | Creston | | | | | | | |
|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------|---------|------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Yellow Pea | | | | | | | | | | | | | | | | |
| AC Agassiz | | | 2812 | 1902 | 1066 | 2169 | 3535 | | | | 2282 | | 4868 | 1172 | 6274 | |
| Bridger | | 1862 | 3170 | 2525 | 1593 | | 2382 | | | | 3747 | 4440 | 4632 | | 5201 | |
| Delta | 3671 | 1674 | 2987 | 2594 | | 2410 | 2519 | | | | 3352 | 4020 | | 889 | 5143 | 5865 |
| DS Admiral | 2941 | 1770 | 2518 | 2385 | 1622 | 2396 | 3005 | | | | 3468 | 1065 | 5018 | 1192 | 5699 | 5793 |
| Montech 4152 | | 1946 | 2899 | 2096 | 1395 | | | | | | 4017 | 4346 | 5009 | | | |
| Spider | | 2155 | 2899 | 1503 | | | | | | | 3657 | 4440 | 4890 | | 5204 | |
| SW Midas | 4029 | 1998 | 3064 | 2333 | 1495 | | | | | | 3340 | 3912 | 4888 | | | |
| Yellow Ave* | 3590 | 1865 | 2907 | 2306 | 1350 | 2405 | 2692 | | | | 3494 | 4404 | 5016 | 1144 | 5414 | 5804 |
| Green Pea | | | | | | | | | | | | | | | | |
| Arcadia | | 2272 | 3029 | 2704 | 1295 | 2499 | | | | | 3545 | 4701 | 4283 | 1155 | | 5935 |
| CDC Striker | 3068 | 1866 | 2375 | 2053 | 1354 | 1960 | | | | | 3126 | 3391 | 3934 | 1137 | | |
| Cruiser | 3144 | 1967 | 2562 | 1543 | 1384 | | 2631 | | | | 2763 | 3150 | 4605 | | 4737 | |
| K2 | | 1894 | 2470 | 2000 | | | | | | | 2982 | 3418 | | | | |
| Majoret | 3812 | 1641 | 2447 | 1439 | 1570 | 2136 | 1710 | | | | 3082 | 4303 | 4430 | 1243 | 5024 | 5185 |
| Stirling | 3525 | 1475 | | | | | | | | | 3278 | | | | | |
| Green Ave* | 3313 | 1750 | 2630 | | 1380 | 2327 | 2258 | | | | 3129 | 3907 | 4462 | 1142 | 4717 | 5135 |
| Trial Mean [§] | 3483 | 1801 | 2779 | 2203 | 1362 | 2376 | 2551 | | | | 3326 | 4215 | 4814 | 1098 | 5193 | 5495 |
| LSD (0.05) [§] | 495 | NS | 1057 | 950 | NS | NS | 733 | | | | 598 | 498 | 710 | 393 | 888 | 456 |
| CV (%) [§] | 10 | 23 | 14 | 30 | 17 | 31 | 20.32 | | | | 12.59 | 8.36 | 10.43 | 25.32 | 12.10 | 5.87 |

*Average values brought from Tables 6 and 12 for yellow and green pea, respectively. [§]Indicate results when both green and yellow dry peas combined and analyzed together.

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Table 17. Statewide Dry Pea Variety Evaluations – 2010 – 2017 Multi-year Grain Yield Summary (lb/ac)...continued

| Varieties | Havre | | | | | | | | Huntley (Dry) | | | | | | | |
|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Yellow Pea | | | | | | | | | | | | | | | | |
| AC Agassiz | | 2236 | 1965 | 2027 | 2215 | 1479 | 2537 | | | 1965 | | 1144 | 1616 | | | |
| Bridger | | 2149 | 1837 | 2127 | 1920 | 1561 | 2065 | 892 | | 2360 | 1975 | 2687 | 892 | 1447 | 536 | |
| Delta | 3600 | 2139 | 2222 | 1700 | | 1793 | 2132 | 1322 | 2517 | 1904 | 1414 | 2648 | | 1635 | 829 | 1542 |
| DS Admiral | 3325 | 2102 | 1798 | 2008 | 2592 | 1897 | 2562 | 1516 | 2743 | 2128 | 1261 | 2840 | 1223 | 1733 | 716 | 1752 |
| Montech 4152 | 3505 | 2266 | 2146 | 1828 | 2056 | | | | 2337 | 1491 | 2637 | 1103 | | | | |
| Spider | | 2071 | 1903 | 1734 | 1953 | 1526 | 2259 | 997 | | 2283 | 1220 | 2710 | 1012 | 1547 | 874 | |
| SW Midas | 3348 | 2111 | 1729 | 2033 | 2100 | | | | 2760 | 2106 | 1855 | 2745 | 1151 | | | |
| <i>Yellow Ave*</i> | 3495 | 2173 | 2039 | 2032 | 2228 | 2199 | 2438 | 1330 | 2773 | 2065 | 1630 | 2707 | 1126 | 1644 | 692 | 1179 |
| Green Pea | | | | | | | | | | | | | | | | |
| Arcadia | | 2405 | 1930 | 2598 | 1817 | 1782 | 2479 | 1174 | | 2224 | 1639 | | 956 | 1617 | 541 | 1663 |
| CDC Striker | 3222 | 2012 | 1953 | 1571 | 1833 | 1528 | | | | 2556 | 1568 | 1128 | | 986 | 1541 | |
| Cruiser | 3194 | 2286 | 1735 | 1669 | 1856 | | 2008 | | 2575 | 1998 | 1232 | 2566 | 991 | | | |
| K2 | | 1576 | 1463 | 1650 | 1773 | | | | 2092 | 1525 | | 821 | | | | |
| Majoret | 3451 | 1612 | 1685 | 2193 | 2105 | 1822 | 2459 | 1220 | 2945 | 1660 | 1331 | | 1128 | 1307 | 693 | 1324 |
| Stirling | 3274 | 1915 | 2122 | | | | | | 2874 | 1527 | 1942 | | | | | |
| <i>Green Ave*</i> | 3241 | 1987 | 1874 | 2011 | 2080 | 1806 | 2265 | 1288 | 2632 | 1729 | 1482 | 2442 | 1042 | 1581 | 667 | 1524 |
| Trial Mean [§] | 3397 | 2069 | 1968 | 2022 | 2170 | 1776 | 2370 | 1312 | 2719 | 1878 | 1556 | 2634 | 1096 | 1623 | 683 | 1635 |
| LSD (0.05) [§] | 325 | NS | 309 | 447 | 294 | 285 | 284 | 174 | NS | NS | NS | 300 | 295 | NS | 245 | 196 |
| CV (%) [§] | 7 | 13 | 11 | 14 | 10 | 11 | 8.47 | 9.38 | 12 | 20 | 29 | 8 | 19 | 15 | 25.32 | 8.48 |

*Average values brought from Tables 6 and 12 for yellow and green pea, respectively. [§]Indicate results when both green and yellow dry peas combined and analyzed together.

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Table 17. Statewide Dry Pea Variety Evaluations – 2010 – 2017 Multi-year Grain Yield Summary (lb/ac)...continued

| Varieties | Joplin | | | | | | | Moccasin | | | | | | | | |
|--------------------------|-------------|------------|-------------|------|------|------|------|-------------|------------|-------------|-------------|-------------|-------------|-------------|------------|------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Yellow Pea | | | | | | | | | | | | | | | | |
| AC Agassiz | | | | | | | | 2855 | 1123 | 1100 | 559 | 2220 | 2287 | 1545 | | |
| Bridger | 773 | | 1387 | | | | | 2981 | 1160 | 1064 | 1826 | 2176 | 1275 | | | |
| Delta | 2491 | 775 | 1454 | | | | | 3139 | 963 | 1313 | 1899 | 2644 | | 1405 | 796 | |
| DS Admiral | 2236 | 1012 | 1299 | | | | | 2642 | 999 | 1295 | 1835 | 2213 | 2731 | 1428 | 1155 | |
| Montech 4152 | 1040 | | 1679 | | | | | 2533 | 1018 | 1084 | 1791 | 2176 | | | | |
| Spider | 908 | | 1202 | | | | | 2572 | 1005 | 1252 | 1750 | 2069 | 2702 | 1392 | | |
| SW Midas | 2371 | 1060 | 1702 | | | | | 2603 | 1031 | 1165 | 1557 | 2019 | | | | |
| Yellow Ave* | 2365 | 969 | 1454 | | | | | 2796 | 992 | 1241 | 1678 | 2165 | 2654 | 1445 | 952 | |
| Green Pea | | | | | | | | | | | | | | | | |
| Arcadia | 1142 | | 2017 | | | | | 978 | | 1186 | 1655 | 2010 | 2333 | 1186 | 876 | |
| CDC Striker | 2016 | 606 | 1517 | | | | | 2427 | 774 | 1193 | 1753 | 2156 | 2212 | | | |
| Cruiser | 2162 | 977 | 1517 | | | | | 2680 | 988 | 1123 | 1502 | 1860 | 1155 | | | |
| K2 | 748 | | 1457 | | | | | 2436 | 851 | 1457 | 1259 | 1780 | | | | |
| Majoret | 2514 | 465 | 1688 | | | | | 2608 | 848 | 1027 | 1584 | 2054 | 2867 | 1265 | 839 | |
| Stirling | 2630 | 1257 | 1854 | | | | | 2907 | 838 | 1392 | | | | | | |
| Green Ave* | 2259 | 790 | 1686 | | | | | 2665 | 887 | 1200 | 1594 | 2029 | 2505 | 1303 | 863 | |
| Trial Means [§] | 2324 | 870 | 1570 | | | | | 2754 | 934 | 1224 | 1640 | 2113 | 2603 | 3160 | 914 | |
| LSD (0.05) [§] | 562 | NS | NS | | | | | 203 | 120 | NS | 291 | 245 | 412 | 1023 | 251 | |
| CV (%) [§] | 17 | 46 | 23 | | | | | 5 | 9 | 16 | 13 | 8 | 11 | 22.89 | 19.6 | |

*Average values brought from Tables 6 and 12 for yellow and green pea, respectively. [§]Indicate results when both green and yellow dry peas combined and analyzed together.

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Table 17. Statewide Dry Pea Variety Evaluations – 2010 – 2017 Multi-year Grain Yield Summary (lb/ac)...continued

| Varieties | Richland | | | | | | | | Sidney dryland | | | | | | | |
|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|----------------|-------------|-------------|------|-------------|------|-------------|------------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Yellow Pea | | | | | | | | | | | | | | | | |
| AC Agassiz | | 2224 | 3242 | 4107 | 1359 | 1596 | 5538 | | | 1619 | | 2436 | | 3915 | | |
| Bridger | 3295 | 2494 | 3878 | 3323 | 1145 | 1875 | 5791 | 863 | | 2998 | 1249 | | 1983 | | 3865 | |
| Delta | 3226 | 1501 | 3706 | 3573 | | 1923 | 5459 | 911 | 3105 | 2662 | 1464 | | | 3628 | 405 | |
| DS Admiral | 3264 | 1664 | 3564 | 3645 | 1153 | 1735 | 5166 | 1004 | 3016 | 2517 | 1158 | | 2693 | | 3591 | 376 |
| Montech 4152 | | 1809 | 3409 | 3786 | 1216 | | | | | 2463 | 1586 | | 2521 | | | |
| Spider | 2731 | 1910 | 1252 | 3959 | 1296 | 1859 | 5428 | 719 | | 2504 | 1297 | | | | | |
| SW Midas | 2321 | 2166 | 2983 | 3873 | 1034 | | 5112 | | 3639 | 2589 | 1571 | | 2909 | | 3715 | |
| Yellow Ave* | 2999 | 1855 | 3566 | 3807 | 1200 | 1908 | 5541 | 1006 | 3489 | 2502 | 1421 | | 2604 | | 3924 | 306 |
| Green Pea | | | | | | | | | | | | | | | | |
| Arcadia | | 1494 | 3143 | 3777 | 1182 | 2273 | 5865 | 669 | | 2772 | 1302 | | 2575 | | 3783 | 280 |
| CDC Striker | 2976 | 1732 | 3270 | 2914 | 1125 | 1652 | | | 3408 | 2212 | 1122 | | 2594 | | | |
| Cruiser | 2642 | 1684 | 3010 | 3289 | 998 | | 5291 | | 2820 | 2223 | 1202 | | 2440 | | 3294 | |
| K2 | 2721 | 1772 | 3476 | 2803 | | | | | 2751 | 2296 | 1435 | | | | 3468 | |
| Majoret | 2981 | 1653 | 3078 | 3022 | 1275 | 1873 | 4897 | 744 | 3342 | 2233 | 1336 | | | | 3819 | 236 |
| Stirling | 2566 | 1493 | 3725 | | | | | | 3052 | 2601 | 2041 | | | | | |
| Green Ave* | 2798 | 1628 | 3410 | 3440 | 1127 | 1907 | 5166 | 935 | 3104 | 2341 | 1406 | | 2515 | | 3571 | 264 |
| Trial Mean [§] | 2922 | 1729 | 3501 | 3622 | 1172 | 1908 | 5416 | 980 | 3341 | 1659 | 1414 | | 2569 | | 3784 | 289 |
| LSD (0.05) [§] | NS | 289 | NS | 777 | NS | NS | 737 | 254 | 792 | NS | 465 | | NS | | 572 | 93 |
| CV (%) [§] | 13 | 10 | 16 | 15 | 30 | 17 | 9.62 | 18.6 | 9 | 14 | 20 | | 13 | | 10.69 | 19.7 |

*Average values brought from Tables 6 and 12 for yellow and green pea, respectively. [§]Indicate results when both green and yellow dry peas combined and analyzed together.

Table 18. Claims and/or Resistance of Commercial Pea Varieties

(This table is claims made by the breeding programs and/or commercial dealers and is not based on research conducted by MAES or EARC).

| Variety* | Powdery Mildew Resistant ¹ | Lodging Resistant ² | Height | <i>Fusarium</i> Resistance ³ | Bleach Resistant ⁴ | Maturity |
|--------------|---------------------------------------|--------------------------------|--------|---|-------------------------------|----------|
| AC Agassiz | X | X | | | | |
| Aragorn | | X | | | X | Med |
| Arcadia | X | X | | | | Early |
| Banner | | X | | | | Early |
| Bluemoon | X | X | Tall | | | Med |
| Bridger | X | X | Tall | | | Early |
| CDC Striker | | | Med | | | Med |
| CDC Treasure | X | X | | | | |
| Cruiser | | X | | X | | Med |
| Daytona | X | X | Tall | | | Med |
| Delta | | | | X | | |
| DS Admiral | X | X | | | | Early |
| Jet Set | X | X | | | | Med |
| K2 | X | X | | | X | Early |
| Korando | | | | | | Early |
| Majoret | | X | | | | Med |
| Montech 4152 | | | Tall | | | |
| Navarro | X | X | | | | Early |
| Spider | X | X | | | | Med |
| SW Midas | X | X | | | | Early |
| Trapeze | X | X | Med | | | Early |

¹Varieties exhibit above average resistance to Powdery Mildew; ²Varieties have above average resistance to lodging;

³Varieties are resistant to *Fusarium*; ⁴Varieties are resistant to bleaching; *Because some of the breeding varieties have not been registered and released as varieties and lack of information for others, this table is not complete and inclusive.

Lentil

Statewide Lentil Variety Evaluation in 2017

A total of 13 lentil varieties were tested in the Statewide lentil variety evaluation trial at 11 sites. The tested varieties include one French green, four medium green, two small green and six small red lentil varieties with a total of 13 varieties.

Lentil grain yield

Substantial yield differences were recorded from site to site. The mean grain yield for the different locations ranging from 190 lb/ac to 3613 lb/ac (Table 20). Average lentil yields were 1510 lb/ac at Bozeman, 1979 lb/ac at Conrad, 726 lb/ac at Corvallis, 3613 lb/ac at Creston, 1345 lb/ac at Havre, 1049 lb/ac at Huntley (dry), 1489 lb/ac at Huntley (irrigated), 702 lb/ac at Moccasin, 960 lb/ac at Richland, 190 lb/ac at Sidney dryland and 1526 at Sidney irrigated. The differences in grain yield among varieties within a site were significant in most cases (Table 20).

Lentil TKW

The thousand kernel weight (TKW) data were measured in most of the locations (Table 21). The mean TKW ranging from 37 g per 1000 seeds recorded at Moccasin to 54.8 gm per 1000 seeds recorded at Sidney dryland. These TKW mean data showed significance differences among varieties for a location except Moccasin (Table 21).

Lentil test weight

The mean test weight varied from site to site. The test weight of the varieties within a site were significant for all sites except Conrad and Huntley dry land (Table 22). The mean test weight ranged from 59.15 lb/bu measured at Conrad to 63.45 lb/bu recorded at Richland (Table 22).

Lentil plant height

The mean plant height ranging from 22 cm recorded at Havre to 72 cm recorded at Conrad (Table 23). Plant height differences among varieties in a site were significant for most of the sites.

Lentil number of days to flowering

The mean number of days to flowering ranging from 54 days recorded at Creston to 72 days recorded at Conrad (Table 24). The differences in mean number of days to flowering were significant for the different varieties at each location. Application of supplemental irrigation showed to extend the number of days to flowering both at Sidney and Huntley.

Table 19. Lentil variety sources and characteristics

| Variety* | Type | Maturity ¹ | Breeding Program ² | Release Date |
|----------------------|-------|-----------------------|-------------------------------|--------------|
| Large Green | | | | |
| CDC Greenland | Green | Mod | CDC | 2006 |
| Merrit | Green | | | |
| Riveland | Green | | | |
| Medium Green | | | | |
| Avondale | Green | | USDA | |
| CDC Richlea | Green | | CDC | |
| Imi-Green | Green | | | |
| Impress CL | Green | | | |
| Small Green | | | | |
| Eston | Green | | | |
| Viceroy | Green | | | |
| Small Red | | | | |
| Crimson | Red | Mod | USDA | 1990 |
| CDC Impact | Red | | CDC | |
| CDC Impala CL | Red | | CDC | |
| CDC Red Coats | Red | | CDC | |
| CDC Redberry | Red | Mod | CDC | 2004 |
| Spanish Brown | | | | |
| Morena | brown | | | |
| Pardina | brown | | | |

¹Compared to trial means; ²Refers to developer: CDC = Crop Development Centre, University of Saskatchewan; NDSU = North Dakota State University; USDA = USDA-ARS Grain Legume Genetics and Physiology Research. The variety characteristics in this table are not complete and inclusive due to lack of information.

Table 20. Montana Statewide Lentil Variety Evaluations – Grain Yield (lb/ac) in 2017. *The yield at Sidney dryland was low due to extreme dry condition.

| Variety/lines | Bozeman | Conrad | Corvallis (Irri.) | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney* (Dry) | Sidney (Irri) |
|---------------------|-------------|-------------|----------------------|-------------|-------------|------------------|--------------------|------------|-------------|------------------|------------------|
| French Green | | | | | | | | | | | |
| CDC Peridot | | | | | 1154 | | | | | | |
| Medium Green | | | | | | | | | | | |
| Avondale | 1651 | 2096 | 667 | 4254 | 1663 | 1210 | 1856 | 801 | 1098 | 276 | 1587 |
| CDC Richlea | 1644 | 2035 | 942 | 4170 | 1557 | 1247 | 1535 | 824 | 1046 | 85 | 1853 |
| CDC Imi-Green | 1309 | 1874 | 691 | 2755 | 1172 | 873 | 1056 | 536 | 977 | 209 | 1431 |
| CDC Impress CL | 1680 | 2171 | 713 | 3157 | 1510 | 1253 | 1439 | 827 | 1016 | 259 | 1679 |
| Small Green | | | | | | | | | | | |
| CDC Invincible | 1477 | 1824 | 731 | 3629 | 1163 | 1011 | 1514 | 687 | 802 | 236 | 1526 |
| CDC Viceroy | 1471 | 2282 | 544 | 3582 | 1331 | 840 | 1339 | 739 | 1010 | 231 | 1487 |
| Small Red | | | | | | | | | | | |
| CDC Dazil | | | | | 1276 | | | | | | |
| CDC Impala CL | 1487 | 2067 | 779 | 3610 | 1132 | 895 | 1552 | 560 | 917 | 191 | 1117 |
| CDC Maxim CL | 1411 | 1538 | 739 | 3637 | 1381 | 1120 | 1616 | 642 | 849 | 41 | 1530 |
| CDC Proclaim | | | | | 1562 | | | | | | |
| PUSA 937 | | | | | 1341 | | | | | | |
| PUSA 975 | | | | | 1266 | | | | | | |
| Mean | 1510 | 1979 | 726 | 3613 | 1345 | 1049 | 1489 | 702 | 960 | 190 | 1526 |
| P-Value | 0.0002 | 0.4372 | 0.4997 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0345 | 0.0946 | 0.0251 | 0.2523 |
| LSD (0.05) | 132 | NS | NS | 452 | 139 | 113 | 222 | 204 | NS | 95 | NS |
| CV (%) | 6.17 | 22.00 | 33.10 | 8.86 | 7.32 | 7.58 | 10.57 | 19.85 | 14.42 | 20.56 | 19.70 |

Table 21. Montana Statewide Lentil Variety Evaluations – Thousand Kernel Weight (TKW) (in g) in 2017

| Variety/lines | Bozeman | Conrad | Corvallis (Irri.) | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri.) |
|---------------------|---------|-----------|----------------------|-----------|-----------|------------------|--------------------|-----------|-----------|-----------------|-------------------|
| French Green | | | | | | | | | | | |
| CDC Peridot | | | | | 34 | | | | | | |
| Medium Green | | | | | | | | | | | |
| Avondale | | 44 | 52 | 45 | 47 | | | 35 | 64 | 68 | 63 |
| CDC Richlea | | 52 | 53 | 48 | 48 | | | 37 | 65 | 70 | 64 |
| CDC Imi-Green | | 56 | 57 | 53 | 53 | | | 43 | 67 | 56 | 66 |
| CDC Impress CL | | 48 | 51 | 49 | 46 | | | 40 | 59 | 59 | 59 |
| Small Green | | | | | | | | | | | |
| CDC Invincible CL | | 28 | 36 | 32 | 27 | | | 37 | 44 | 45 | 41 |
| CDC Viceroy | | 34 | 34 | 32 | 27 | | | 37 | 42 | 45 | 40 |
| Small Red | | | | | | | | | | | |
| CDC Dazil | | | | | 28 | | | | | | |
| CDC Impala CL | | 28 | 32 | 30 | 26 | | | 34 | 39 | 39 | 37 |
| CDC Maxim CL | | 36 | 39 | 35 | 34 | | | 33 | 53 | 50 | 46 |
| CDC Proclaim | | | | | 38 | | | | | | |
| PUSA 937 | | | | | 61 | | | | | | |
| PUSA 975 | | | | | 32 | | | | | | |
| Mean | | 41 | 44 | 40 | 39 | | | 37 | 53.6 | 54.8 | 52 |
| P-Value | | <0.0001 | <0.0001 | <0.0001 | <0.0001 | | | 0.8992 | <0.0001 | <0.0001 | <0.0001 |
| LSD (0.05) | | 8.0 | 2.0 | 1.8 | 1.2 | | | NS | 4.2 | 4.8 | 4.8 |
| CV (%) | | 14.00 | 3.29 | 3.19 | 2.21 | | | 28.83 | 5.57 | 6.02 | 5.32 |

Table 22. Montana Statewide Lentil Variety Evaluations – Test Weight (lb/bu) in 2017

| Variety/lines | Bozeman | Conrad | Corvallis (Irr.) | Creston | Havre | Huntley (Dry) | Huntley (Irr.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irr.) |
|---------------------|---------|--------------|---------------------|--------------|--------------|------------------|-------------------|--------------|--------------|-----------------|------------------|
| French Green | | | | | | | | | | | |
| CDC Peridot | | | | | 63.95 | | | | | | |
| Medium Green | | | | | | | | | | | |
| Avondale | | 59.18 | 61.20 | 62.38 | 62.05 | 61.30 | 61.18 | 61.73 | 61.85 | 61.05 | 62.63 |
| CDC Richlea | | 57.43 | 61.28 | 60.95 | 60.80 | 62.33 | 59.83 | 61.13 | 61.37 | 60.19 | 60.07 |
| CDC Imi-Green | | 58.43 | 60.65 | 61.20 | 60.83 | 62.43 | 60.33 | 62.25 | 61.93 | 60.12 | 61.63 |
| CDC Impress CL | | 58.47 | 61.27 | 61.90 | 61.40 | 63.77 | 61.60 | 61.98 | 63.03 | 60.80 | 61.03 |
| Small Green | | | | | | | | | | | |
| CDC Invincible CL | | 59.80 | 63.77 | 63.48 | 63.75 | 61.75 | 63.45 | 64.75 | 64.83 | 62.46 | 63.27 |
| CDC Viceroy | | 60.03 | 63.55 | 64.23 | 64.00 | 61.75 | 63.75 | 65.35 | 65.33 | 63.39 | 63.07 |
| Small Red | | | | | | | | | | | |
| CDC Dazil | | | | | 62.88 | | | | | | |
| CDC Impala CL | | 60.70 | 63.83 | 64.85 | 64.75 | 61.45 | 63.85 | 65.28 | 65.23 | 64.04 | 64.47 |
| CDC Maxim CL | | 58.98 | 63.03 | 63.55 | 63.58 | 60.88 | 62.78 | 64.13 | 63.45 | 62.31 | 63.17 |
| CDC Proclaim | | | | | 63.05 | | | | | | |
| PUSA 937 | | | | | 60.58 | | | | | | |
| PUSA 975 | | | | | 63.78 | | | | | | |
| <i>Mean</i> | | 59.15 | 62.16 | 62.84 | 62.72 | 62.00 | 62.11 | 63.00 | 63.45 | 61.86 | 62.42 |
| <i>P-Value</i> | | 0.0640 | 0.0016 | <0.0001 | <0.0001 | 0.5603 | <0.0001 | <0.0001 | <0.0001 | 0.0025 | 0.0019 |
| <i>LSD (0.05)</i> | | NS | 1.15 | 0.48 | 0.39 | NS | 0.35 | 0.75 | 0.42 | 0.87 | 1.73 |
| <i>CV (%)</i> | | 2.28 | 1.31 | 0.54 | 0.43 | 2.71 | 0.40 | 0.81 | 0.48 | 0.99 | 1.58 |

Table 23. Montana Statewide Lentil Variety Evaluations – Plant Height (cm) in 2017

| Variety/lines | Bozeman | Conrad | Corvallis (Irri.) | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri) |
|---------------------|-----------|-----------|----------------------|-----------|-----------|------------------|--------------------|-----------|-----------|-----------------|------------------|
| French Green | | | | | | | | | | | |
| CDC Peridot | | | | | 21 | | | | | | |
| Medium Green | | | | | | | | | | | |
| Avondale | 58 | 69 | 30 | 53 | 23 | 36 | 35 | 34 | 28 | 26 | 36 |
| CDC Richlea | 59 | 70 | 32 | 51 | 23 | 38 | 37 | 32 | 26 | 28 | 37 |
| CDC Imi-Green | 63 | 71 | 40 | 53 | 23 | 42 | 35 | 38 | 34 | 33 | 44 |
| CDC Impress CL | 62 | 70 | 35 | 52 | 24 | 38 | 32 | 34 | 26 | 27 | 36 |
| Small Green | | | | | | | | | | | |
| CDC Invincible | 65 | 76 | 30 | 54 | 22 | 33 | 36 | 31 | 25 | 25 | 35 |
| CDC Viceroy | 64 | 76 | 31 | 50 | 23 | 35 | 35 | 33 | 25 | 24 | 34 |
| Small Red | | | | | | | | | | | |
| CDC Dazil | | | | | 21 | | | | | | |
| CDC Impala CL | 65 | 76 | 27 | 49 | 23 | 34 | 36 | 29 | 23 | 25 | 33 |
| CDC Maxim CL | 61 | 70 | 31 | 56 | 21 | 34 | 38 | 30 | 26 | 23 | 33 |
| CDC Proclaim | | | | | 22 | | | | | | |
| PUSA 937 | | | | | 25 | | | | | | |
| PUSA 975 | | | | | 21 | | | | | | |
| Mean | 62 | 72 | 32 | 52 | 22 | 36 | 35 | 32 | 26 | 26 | 36 |
| P-Value | <0.0001 | <0.0001 | 0.0003 | 0.1578 | 0.0012 | <0.0001 | 0.0557 | 0.0046 | <0.0001 | 0.0403 | 0.1877 |
| LSD (0.05) | 1.6 | 0.76 | 4.0 | NS | 1.9 | 2.6 | NS | 3.9 | 2.8 | 5.2 | NS |
| CV (%) | 1.84 | 0.74 | 9.12 | 6.72 | 5.87 | 5.08 | 6.57 | 8.26 | 7.46 | 11.34 | 12.89 |

Table 24. Montana Statewide Lentil Variety Evaluations – Number of Days to Flowering in 2017

| Variety/lines | Bozeman | Conrad | Corvallis (Irri.) | Creston | Havre | Huntley (Dry) | Huntley (Irri.) | Moccasin | Richland | Sidney (Dry) | Sidney (Irri.) |
|---------------------|-----------|-----------|----------------------|-----------|-----------|------------------|--------------------|-----------|----------|-----------------|-------------------|
| French Green | | | | | | | | | | | |
| CDC Peridot | | | | | 61 | | | | | | |
| Medium Green | | | | | | | | | | | |
| Avondale | 58 | 69 | | 51 | 61 | 58 | 61 | 62 | | 64 | 66 |
| CDC Richlea | 59 | 70 | | 54 | 62 | 58 | 62 | 63 | | 71 | 72 |
| CDC Imi-Green | 63 | 71 | | 54 | 63 | 59 | 62 | 63 | | 66 | 72 |
| CDC Impress CL | 62 | 70 | | 54 | 63 | 58 | 62 | 62 | | 71 | 72 |
| Small Green | | | | | | | | | | | |
| CDC Invincible CL | 65 | 76 | | 56 | 67 | 62 | 63 | 66 | | 69 | 70 |
| CDC Viceroy | 64 | 76 | | 56 | 66 | 61 | 63 | 65 | | 71 | 69 |
| Small Red | | | | | | | | | | | |
| CDC Dazil | | | | | 64 | | | | | | |
| CDC Impala CL | 65 | 76 | | 57 | 67 | 62 | 64 | 66 | | 71 | 73 |
| CDC Maxim CL | 61 | 70 | | 54 | 62 | 58 | 61 | 62 | | 72 | 66 |
| CDC Proclaim | | | | | 61 | | | | | | |
| PUSA 937 | | | | | 62 | | | | | | |
| PUSA 975 | | | | | 62 | | | | | | |
| Mean | 62 | 72 | | 54 | 63 | 59 | 62 | 63 | | 69 | 70 |
| P-Value | <0.0001 | <0.0001 | | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | | <0.0001 | <0.0001 |
| LSD (0.05) | 1.6 | 0.76 | | 0.3 | 0.78 | 0.88 | 0.67 | 1.1 | | 0.8 | 0.8 |
| CV (%) | 1.84 | 0.74 | | 0.45 | 0.86 | 1.04 | 0.76 | 1.17 | | 0.63 | 0.61 |

Multi-Year and Multi-Location Statewide Lentil Variety Evaluation Summary

Table 25. Statewide Lentil Variety Evaluations – 2010 – 2017 Multi-year grain yield summary (lb/ac)

| Variety | Bozeman | | | | | | | | Conrad | | | | | | | |
|---------------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|--------------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Small Green | | | | | | | | | | | | | | | | |
| Essex | 2111 | 1538 | 462 | | 1839 | | | | 436 | 2842 | 1823 | | 1865 | | | |
| Medium Green | | | | | | | | | | | | | | | | |
| Brewer | 1855 | 1340 | 528 | | | | | | 381 | 2034 | 1120 | | | | | |
| CDC Richlea | 2266 | 1534 | 569 | 1400 | 1911 | 1113 | 1522 | 1644 | 623 | 2307 | 1800 | 1698 | 1752 | 665 | 3288 | 2035 |
| Avondale | 2224 | 1578 | 685 | 1745 | 1919 | 1083 | 1238 | 1651 | 687 | 2284 | 1696 | 1501 | 1597 | 535 | 2226 | 2096 |
| Large Green | | | | | | | | | | | | | | | | |
| Merrit | 2064 | 1360 | 607 | | 1444 | | | | 385 | 2151 | 1243 | | 1744 | | | |
| Riveland | 1825 | 1558 | 567 | | 1736 | | | | 324 | 1821 | 1464 | | 1616 | | | |
| Small Red | | | | | | | | | | | | | | | | |
| Crimson | 1999 | 1281 | 588 | 1424 | 1725 | | | | 544 | 1762 | 1543 | 1039 | 1590 | | | |
| CDC Redberry | 982 | 1400 | | 1348 | 1700 | | | | 833 | 2318 | 1338 | 1351 | 1869 | | | |
| <i>Mean</i> | <i>1953</i> | <i>1476</i> | <i>560</i> | <i>1363</i> | <i>1723</i> | <i>974</i> | <i>1315</i> | <i>1510</i> | <i>533</i> | <i>2227</i> | <i>1496</i> | <i>1460</i> | <i>1682</i> | <i>716</i> | <i>2636</i> | <i>1979</i> |
| <i>LSD (0.05)</i> | <i>382</i> | <i>138</i> | <i>98</i> | <i>167</i> | <i>NS</i> | <i>NS</i> | <i>217</i> | <i>132</i> | <i>214</i> | <i>NS</i> | <i>NS</i> | <i>236</i> | <i>NS</i> | <i>NS</i> | <i>550</i> | <i>NS</i> |
| <i>CV (%)</i> | <i>14</i> | <i>7</i> | <i>12</i> | <i>8</i> | <i>19</i> | <i>14</i> | <i>9</i> | <i>6.17</i> | <i>28</i> | <i>21</i> | <i>25</i> | <i>11</i> | <i>24</i> | <i>60</i> | <i>14</i> | <i>22.00</i> |
| Variety | Corvallis | | | | | | | | Creston | | | | | | | |
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Small Green | | | | | | | | | | | | | | | | |
| Essex | 1087 | | 536 | | 450 | | | | 2464 | 2091 | 1409 | | 1299 | | | |
| Medium Green | | | | | | | | | | | | | | | | |
| Brewer | 964 | | 405 | | | | | | 2164 | 1464 | 1250 | | | | | |
| CDC Richlea | 973 | | 893 | 1330 | 471 | 1735 | 1299 | 942 | 2150 | 1873 | 1625 | 1303 | 1753 | 969 | 2674 | 4170 |
| Avondale | 1052 | | 837 | 1387 | 528 | 1421 | 927 | 667 | 2626 | 2024 | 1790 | 1244 | 1625 | 925 | 2992 | 4524 |
| Large Green | | | | | | | | | | | | | | | | |
| Merrit | 690 | | 394 | | 536 | | | | 1954 | 1730 | 1038 | | 1094 | | | |
| Riveland | 430 | | 552 | | 340 | | | | 1898 | 1547 | 1310 | | 710 | | | |
| Small Red | | | | | | | | | | | | | | | | |
| Crimson | 1095 | | 838 | 951 | 365 | | | | 2259 | 2095 | 1245 | 1238 | 1021 | | | |
| CDC Redberry | 1059 | | 706 | 795 | 540 | | | | 2346 | 2090 | | 1816 | 1851 | | | |
| <i>Mean</i> | <i>860</i> | | <i>700</i> | <i>1155</i> | <i>511</i> | <i>1366</i> | <i>1066</i> | <i>726</i> | <i>2164</i> | <i>1822</i> | <i>1345</i> | <i>1347</i> | <i>1409</i> | <i>911</i> | <i>2894</i> | <i>3613</i> |
| <i>LSD (0.05)</i> | <i>348</i> | | <i>354</i> | <i>222</i> | <i>NS</i> | <i>NS</i> | <i>NS</i> | <i>NS</i> | <i>456</i> | <i>NS</i> | <i>421</i> | <i>279</i> | <i>136</i> | <i>NS</i> | <i>460</i> | <i>452</i> |
| <i>CV (%)</i> | <i>28</i> | | <i>36</i> | <i>13</i> | <i>35</i> | <i>32</i> | <i>33</i> | <i>33.10</i> | <i>15</i> | <i>22</i> | <i>22</i> | <i>14</i> | <i>28</i> | <i>26</i> | <i>11</i> | <i>8.86</i> |

----- Continued on next page -----

Table 25. Statewide Lentil Variety Evaluations – 2010 – 2017 Multi-year Grain Yield Summary (lb/ac)...continued

| Variety | Havre | | | | | | | | Huntley (Dry) | | | | | | | |
|---------------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|-------------|---------------|------------|------------|-------------|-------------|-------------|-------------|--------------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016* | 2017 |
| Small Green | | | | | | | | | | | | | | | | |
| Essex | 3119 | 1838 | | | 2131 | | | | 464 | 784 | 569 | | 843 | | | |
| Medium Green | | | | | | | | | | | | | | | | |
| Brewer | 2487 | 1024 | 1121 | | | | | | 425 | 402 | 583 | | | | | |
| CDC Richlea | 2853 | 1743 | 830 | 1530 | 1649 | 1081 | 2991 | 1557 | 569 | 873 | 734 | 1585 | 699 | 987 | 315 | 1247 |
| Avondale | 2790 | 1385 | 874 | 1483 | 1808 | 1046 | 3170 | 1663 | 926 | 877 | | 1767 | 718 | 1274 | 133 | 1210 |
| Large Green | | | | | | | | | | | | | | | | |
| Merrit | 2868 | 1127 | 977 | | 1306 | | | | 466 | 717 | 523 | | 499 | | | |
| Riveland | 2463 | 968 | 1033 | | 1282 | | | | 399 | 717 | 727 | | 557 | | | |
| Small Red | | | | | | | | | | | | | | | | |
| Crimson | 2343 | 1705 | 902 | 625 | 1685 | | | | 738 | 458 | 607 | 1683 | 578 | | | |
| CDC Redberry | 2592 | 904 | 846 | 760 | 1440 | | | | 684 | 819 | 620 | 1956 | 412 | | | |
| <i>Mean</i> | <i>2736</i> | <i>1362</i> | <i>830</i> | <i>1123</i> | <i>1557</i> | <i>912</i> | <i>2869</i> | <i>1345</i> | <i>573</i> | <i>672</i> | <i>614</i> | <i>1690</i> | <i>650</i> | <i>1100</i> | <i>295</i> | <i>1049</i> |
| <i>LSD (0.05)</i> | <i>340</i> | <i>299</i> | <i>179</i> | <i>173</i> | <i>352</i> | <i>27</i> | <i>301</i> | <i>139</i> | <i>272</i> | <i>NS</i> | <i>167</i> | <i>NS</i> | <i>141</i> | <i>NS</i> | | <i>113</i> |
| <i>CV (%)</i> | <i>9</i> | <i>10</i> | <i>15</i> | <i>11</i> | <i>15</i> | <i>7</i> | <i>7</i> | <i>7.32</i> | <i>33</i> | <i>54</i> | <i>19</i> | <i>16</i> | <i>15</i> | <i>17</i> | | <i>7.58</i> |
| Variety | Joplin | | | | | | | | Moccasin | | | | | | | |
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Small Green | | | | | | | | | | | | | | | | |
| Essex | 2491 | 726 | 2521 | | | | | | | 1743 | | 2036 | 918 | 809 | 1713 | |
| Medium Green | | | | | | | | | | | | | | | | |
| Brewer | 2236 | 350 | 2027 | | | | | | 1768 | 730 | 756 | | | | | |
| CDC Richlea | 2371 | 616 | 1919 | | | | | | 2062 | 1100 | 958 | 1904 | 1672 | 952 | 1513 | 824 |
| Avondale | | 581 | 2421 | | | | | | 1944 | 903 | 955 | 1859 | 1440 | 751 | 1445 | 801 |
| Large Green | | | | | | | | | | | | | | | | |
| Merrit | 2549 | 546 | 2127 | | | | | | 1890 | 771 | 838 | | 1258 | | | |
| Riveland | | 247 | 2303 | | | | | | 1805 | 926 | 827 | | 1519 | | | |
| Small Red | | | | | | | | | | | | | | | | |
| Crimson | 2162 | 774 | 1479 | | | | | | 1919 | 911 | 907 | 1403 | 1087 | | | |
| CDC Redberry | 1973 | 785 | 1717 | | | | | | 1642 | 764 | | 1491 | 1456 | | | |
| <i>Mean</i> | <i>2324</i> | <i>624</i> | <i>2077</i> | | | | | | <i>1906</i> | <i>888</i> | <i>833</i> | <i>1538</i> | <i>1383</i> | <i>754</i> | <i>1326</i> | <i>702</i> |
| <i>LSD (0.05)</i> | <i>562</i> | <i>NS</i> | <i>NS</i> | | | | | | <i>NS</i> | <i>NS</i> | <i>144</i> | <i>320</i> | <i>248</i> | <i>NS</i> | <i>233</i> | <i>204</i> |
| <i>CV (%)</i> | <i>17</i> | <i>44</i> | <i>20</i> | | | | | | <i>11</i> | <i>24</i> | <i>12</i> | <i>15</i> | <i>13</i> | <i>27</i> | <i>12</i> | <i>19.85</i> |

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Table 25. Statewide Lentil Variety Evaluations – 2010 – 2017 Multi-year Grain Yield Summary (lb/ac)...continued

| Variety | Richland | | | | | | | | Sidney (Dry) | | | | | | | |
|---------------------|-------------|------------|-------------|-------------|------------|------------|-------------|--------------|--------------|-------------|------------|------|------------|------|-------------|--------------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
| Small Green | | | | | | | | | | | | | | | | |
| Essex | 1752 | 1097 | 1705 | | 441 | | | | 2251 | 1737 | 458 | | 1057 | | | |
| Medium Green | | | | | | | | | | | | | | | | |
| Brewer | 1324 | 581 | 1882 | | | | | | 1423 | 1061 | 184 | | | | | |
| CDC Richlea | 1562 | 1077 | 1874 | 1914 | 755 | 1138 | 1346 | 1046 | 1959 | 1594 | 530 | | 1170 | | 2325 | 85 |
| Avondale | 1850 | 1398 | 2041 | 2193 | 582 | 1075 | 1678 | 1098 | 2169 | 1774 | 453 | | 982 | | 2315 | 276 |
| Large Green | | | | | | | | | | | | | | | | |
| Merrit | 1435 | 880 | 1710 | | 371 | | | | 1350 | 1418 | 222 | | 704 | | | |
| Riveland | 1571 | 836 | 1712 | | 398 | | | | 1564 | 1413 | 401 | | 821 | | | |
| Small Red | | | | | | | | | | | | | | | | |
| Crimson | 1222 | 859 | 1734 | 1573 | 287 | | | | 1924 | 981 | 261 | | 947 | | | |
| CDC Redberry | 1390 | 933 | 1743 | 1582 | 524 | | | | 2186 | 1604 | 448 | | 867 | | | |
| <i>Mean</i> | <i>1537</i> | <i>945</i> | <i>1666</i> | <i>1896</i> | <i>479</i> | <i>999</i> | <i>1567</i> | <i>960</i> | <i>1835</i> | <i>1444</i> | <i>371</i> | | <i>938</i> | | <i>2200</i> | <i>190</i> |
| <i>LSD (0.05)</i> | <i>294</i> | <i>392</i> | <i>332</i> | <i>603</i> | <i>206</i> | | <i>23</i> | <i>NS</i> | <i>390</i> | <i>434</i> | <i>NS</i> | | <i>165</i> | | <i>NS</i> | <i>95</i> |
| <i>CV (%)</i> | <i>11</i> | <i>25</i> | <i>12</i> | <i>22</i> | <i>31</i> | | <i>10</i> | <i>14.42</i> | <i>13</i> | <i>17</i> | <i>42</i> | | <i>12</i> | | <i>26</i> | <i>20.56</i> |

Chickpea

Statewide Chickpea Variety Evaluation in 2017

The statewide chickpea variety evaluation includes eight (seven Kabuli types and one Dessie type) commercial varieties and tested at nine locations. The results from Moccasin was extremely low due to deer damaged (deer eat the pods). But the cultivar Myles performed better at this location than others. This could indicate that the deer might not be interested in this cultivar and could lead to further research. The mean yields at Sidney dryland and Richland were low due to low precipitation. The mean grain yield for all locations ranging from 106 lb/ac to 2435 lb/ac. The mean grain yields were 2305 lb/ac at Bozeman, 2435 at Conrad, 1240 lb/ac at Corvallis, 1675 lb/ac at Huntley dryland, 2424 lb/ac Huntley irrigated, 145 lb/ac Sidney dryland, 2115 lb/ac Sidney irrigated and 306 lb/ac at Richland site (Table 27). The mean grain yield differences for the different varieties were significant for all locations except Conrad and Corvallis.

We evaluated the seed size of chickpea varieties from statewide chickpea variety trial harvested from Sidney dryland, Sidney irrigated and Richland sites using sieve with 8.73 mm (22/64) diameter round openings. The results are shown in Table 28. The variety Nash has the highest percentage of grain size greater than 8.73 mm diameter compared with the other varieties consistently in the three locations followed by Royal (Table 28). The variety Myles (desi type) resulted in lowest percentage of seed size (in some cases nil) greater than 7.83 mm.

Table 26. Chickpea variety type and characteristics

| Variety | Type |
|--------------|------------------|
| Dwellely | Large Café Kabul |
| CDC Alma | Med/Large Kabuli |
| CDC Frontier | Large Kabuli |
| CDC Orion | Large Kabuli |
| Myles | Desi |
| Nash | Café Kabul |
| Royal | Café Kabul |
| Sawyer | Café Kabul |

Table 27. Statewide Chickpea Variety Evaluation – Yield (lb/ac) in 2017

| Variety/lines | Bozeman | Conrad | Corvallis (Irri.) | Huntley (Dryland) | Huntley (Irri.) | Moccasin* | Richland [±] | Sidney (dry) [±] | Sidney (Irri.) |
|-------------------|-------------|-------------|----------------------|----------------------|--------------------|------------|-----------------------|------------------------------|-------------------|
| CDC Alma | 2244 | 2305 | 773 | 965 | 1889 | 15 | 409 | 76 | 2186 |
| CDC Frontier | 2748 | 2349 | 1479 | 1859 | 3774 | 20 | 294 | 113 | 2367 |
| CDC Orion | 2490 | 2756 | 1500 | 1946 | 3076 | 38 | 168 | 168 | 2230 |
| Myles | 2014 | 2267 | 1285 | 1684 | 3199 | 718 | 257 | 277 | 2228 |
| Nash | 2160 | 2390 | 1321 | 1695 | 740 | 10 | 213 | 136 | 2013 |
| Royal | 2366 | 2543 | 1288 | 1701 | 1532 | 8 | 354 | 144 | 2213 |
| Sawyer | 2518 | 2375 | 1281 | 2079 | 3230 | 18 | 366 | 119 | 2133 |
| Sierra | 1903 | 2502 | 997 | 1473 | 1957 | 20 | 438 | 140 | 1557 |
| Mean | 2305 | 2435 | 1240 | 1675 | 2424 | 106 | 306 | 145 | 2115 |
| P-Value | 0.0142 | 0.4832 | 0.0502 | <0.0001 | <0.0001 | <0.0001 | 0.0011 | 0.0180 | 0.0015 |
| LSD (0.05) | 449 | NS | NS | 343 | 677 | 88 | 81 | 48 | 293 |
| CV (%) | 13.24 | 13.33 | 24.89 | 13.96 | 19.00 | 56.46 | 18.77 | 23.43 | 7.93 |

*Yield from Moccasin was low due to deer damage (deer grazed the pods). [±]Yield from Sidney dryland and Richland was low due to moisture stress (low precipitation).

Table 28. Mean percent of seed size of chickpea varieties with seed size greater than 8.73 mm (22/64) diameter. The samples were collected from statewide chickpea variety evaluation trials at Sidney dryland, Sidney irrigated and Richland sites, MT in 2017.

| Variety | Percent of seed size > 8.73 mm (22/64) diameter | | |
|-------------------|---|----------------|-------------|
| | Sidney Irrigated | Sidney Dryland | Richland |
| CDC Alma | 18.0 | 20.7 | 36.3 |
| CDC Frontier | 10.0 | 20.7 | 40.0 |
| CDC Orion | 60.0 | 38.3 | 66.3 |
| Myles | 0.0 | 0.3 | 0.3 |
| Nash | 91.3 | 72.5 | 85.3 |
| Royal | 84.7 | 64.7 | 78.8 |
| Sawyer | 28.7 | 38.5 | 57.5 |
| Sierra | 68.7 | 44.7 | 76.3 |
| Mean | 45.0 | 36.0 | 55.0 |
| P-value | <0.0001 | <0.0001 | <0.0001 |
| LSD (0.05) | 8.7 | 7.5 | 17.2 |
| CV | 10.96 | 14.78 | 21.29 |

Multi-Year and Multi-Location Statewide Chickpea Variety Evaluation Summary

Table 29. Multi-Year and Multi-Location Statewide Chickpea Variety Evaluations –
2013– 2017 - Grain Yield Summary (lb/ac)

| Variety | Bozeman | | | | | Conrad | | | | |
|-------------------|-----------------|-------------|-------------|-------------|--------------|-------------|------------|-------------|-------------|-------------|
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2013 | 2014 | 2015 | 2016 | 2017 |
| BGC08008M | | | | | | | | | | |
| BGC08009M | | | | | | | | | | |
| BGC090016 | | | | | | | | | | |
| BGC090023 | | | | | | | | | | |
| CA0790B0042C | | | | | | | | | | |
| CA0790B0547C | | | | | | | | | | |
| CA0790B0549C | | | | | | | | | | |
| CAO890B0427C | | | | | | | | | | |
| CDC Alma | 1396 | 1458 | | | 2244 | 3250 | 214 | | 3172 | 2305 |
| CDC Frontier | 1594 | | | | 2748 | 2488 | | | 5463 | 2349 |
| CDC Orion | 1574 | 1923 | | | 2490 | 3008 | 118 | | 3662 | 2756 |
| Myles | 1233 | 1821 | | | 2014 | 1294 | 476 | | 3306 | 2267 |
| <i>Mean*</i> | 1449 | 1734 | | | 2305 | 2510 | 269 | | 3963 | 2435 |
| <i>LSD (0.05)</i> | 145 | NS | | | 449 | 412 | 189 | | 754 | NS |
| <i>CV (%)</i> | 6 | 24 | | | 13.24 | 10 | 43 | | 13 | 13.3 |
| Variety | Huntley (irri.) | | | | | Moccasin | | | | |
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2013 | 2014 | 2015 | 2016 | 2017 |
| BGC08008M | | | | | | 1810 | | | | |
| BGC08009M | | | | | | 2084 | | | | |
| BGC090016 | | | | | | 1719 | | | | |
| BGC090023 | | | | | | 1812 | | | | |
| CA0790B0042C | | | | | | 1600 | | | | |
| CA0790B0547C | | | | | | 1551 | | | | |
| CA0790B0549C | | | | | | 1700 | | | | |
| CAO890B0427C | | | | | | 1807 | | | | |
| CDC Alma | 1467 | 3082 | | 3012 | 1889 | 1533 | 1036 | | | 15 |
| CDC Frontier | 1874 | | 2970 | 4592 | 3774 | 1420 | 1020 | 1337 | | 20 |
| CDC Orion | 1521 | 3598 | 3191 | 3494 | 3076 | 1806 | 999 | 1477 | | 38 |
| Myles | 2411 | 2979 | 2474 | 3379 | 3199 | 1392 | 1566 | 1164 | | 718 |
| <i>Mean*</i> | 1818 | 3219 | 2707 | 3844 | 2424 | 1623 | 871 | 1155 | | 106 |
| <i>LSD (0.05)</i> | NS | 510 | 459 | NS | 677 | 425 | 307 | NS | | 88 |
| <i>CV (%)</i> | 35 | 9 | 11 | 29 | 19.00 | 18 | 24 | 21 | | 56.4 |

*Trial means include other varieties as indicated in the previous table (Table 31).

-----Continued -----

Table 29. Multi-Year and Multi-Location Statewide Chickpea Variety Evaluations –
 2013– 2017 - Grain Yield Summary (lb/ac) -----Continued -----

| Variety | Corvallis (irri.) | | | | | Richland | | | | |
|-------------------|-------------------|-------------|------|------|--------------|-------------|------------|-------------|--------------|--------------|
| | 2013 | 2014 | 2015 | 2016 | 2017 | 2013 | 2014 | 2015 | 2016 | 2017 |
| BGC08008M | | | | | | 2339 | | | | |
| BGC08009M | | | | | | 3902 | | | | |
| BGC090016 | | | | | | 2019 | | | | |
| BGC090023 | | | | | | 2619 | | | | |
| CA0790B0042C | | | | | | 506 | | | | |
| CA0790B0547C | | | | | | 1617 | | | | |
| CA0790B0549C | | | | | | 1227 | | | | |
| CA0890B0427C | | | | | | 867 | | | | |
| CDC Alma | | 734 | | | 773 | 2763 | 599 | | 186 | 409 |
| CDC Frontier | | | | | 1479 | 3529 | 838 | 2020 | 277 | 294 |
| CDC Orion | | 934 | | | 1500 | 2930 | 416 | 1958 | 135 | 168 |
| Myles | | 1155 | | | 1285 | 2641 | 922 | 1027 | 87 | 257 |
| <i>Mean*</i> | | <i>1087</i> | | | <i>1240</i> | <i>2363</i> | <i>459</i> | <i>1619</i> | <i>137</i> | <i>306</i> |
| <i>LSD (0.05)</i> | | <i>NS</i> | | | <i>NS</i> | <i>784</i> | <i>245</i> | <i>85</i> | <i>68</i> | <i>81</i> |
| <i>CV (%)</i> | | <i>43</i> | | | <i>24.89</i> | <i>23</i> | <i>37</i> | <i>11</i> | <i>35.32</i> | <i>18.77</i> |

FUTURE PLANS

The contribution of dry pea, lentil and chickpea for cropping systems sustainability and for the State's economy is substantial. In addition, the national and international demand for these crops as plant based protein is considerable. Therefore, this project will continue to evaluate spring dry pea, lentil and chickpea varieties and experimental lines across Montana to generate information that can help to make informed decision based on availability of fund and resources. Beside variety evaluation, research is needed to develop best agronomic management practices to increase yield and improve quality of these crops. These include but not limited to nutrient management, weed control both for conventional and organic pulse growers and enhancing biological nitrogen fixation. We hope research fund, support and collaboration among researchers will continue to achieve the objective.

Note: The results and summary mentioned in this annual report are for **informational purposes only**. Inclusion and or exclusion of any commercial variety in this summary does not constitute a recommendation by MSU-MAES or EARC.

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