



UNIVERSITY OF
SASKATCHEWAN

**VEGETABLE
CULTIVAR AND CULTURAL
TRIALS
2016**

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The data presented apply to specific growing conditions and production practices and may not be applicable under all conditions or practices.

More detailed results on any trial may be obtained by contacting:

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Production Practices

Crop production and pest control measures used in these trials generally followed recommended practices. Soil fertility levels were adjusted according to the recommendations outlined in the Horticulture Science Publication: "Vegetable Crop Fertility Schedules" (ERDA Publication No. 88-3). Most crops received a mid-season application of nitrogen, either through the irrigation system or via side or top-dressing. Overhead or drip irrigation was to maintain adequate soil moisture levels throughout the growing season.

The garlic trial was hand planted into fair field conditions in mid-April.

The direct-seeded onion, dill, romaine and head lettuce crops tested in 2016 were seeded using a single row push type disk seeder.

Row spacings

Transplanted crops

Celery – twin rows spaced 30 cm apart with 30 cm between plants within the row – rows spaced 1.25 m apart

Romaine and head lettuce - twin rows spaced 30 cm apart with 30 cm between plants within the row – rows spaced 1.25 m apart

Eggplants and peppers – twin rows spaced 30 cm apart with 60 cm between plants in a row and 2 m between rows.

Cabbage and cauliflower – plants spaced 30 cm apart in rows with rows spaced 1.25 m apart

Directed seeded crops

Bulb onions – rows spaced 50 cm apart with 10 cm between plants within a row.

Green onions – rows spaced 50 cm apart with 2 cm between plants within a row.

Romaine and head lettuce – twin rows spaced 30 cm apart, with 1 m between each set of twin rows. Two weeks after emergence the lettuce was hand thinned to leave 20 cm between plants within the row.

Dill - twin rows spaced 15 cm apart with each set of rows spaced 0.5 m apart. A high seeding rate (1 seed/cm) was used as the objective was to produce a thick stand of plants that could be harvested at an early stage of development.

The celery (9 week old), peppers (8 week old), eggplants (7 week old), cabbage, cauliflower and Brussels sprouts (5 week old), romaine and head lettuce (4 week old) transplants were grown in the University of Saskatchewan Greenhouses. A Waterwheel type transplanter was used for all transplanted crops.

The following products were used for weed control;

Asparagus - Sencor applied prior to crop emergence. Lorox applied between rows after harvest completed.

Brussels Sprouts - Treflan applied just prior to transplanting

Cauliflower and Cabbage – Treflan applied just prior to transplanting

Celery – Lorox applied 2 weeks after transplanting.

Dill – Lorox applied once crop reached 2 true leaf stage.

Peppers and Eggplant - Treflan applied prior to laying plastic mulch. Chateau and glyphosate applied with a shielded sprayer was used to control weeds between rows of mulch.

Onions – Chateau applied before crop emergence. Once the crop reached the 2 true leaf stage, Goal was applied, followed 2 weeks later by Buctril, followed 2 weeks later by another application of Goal.

Any weed escapes in the herbicide treated plots were controlled by hand weeding, as were the weeds in the crops where no herbicide was applied (romaine lettuce).

In the Brussel’s sprouts Lorsban applied as a soil drench was used to control root maggots. The first application went on within a week of transplanting, with another application occurring 3 weeks later. Control of cabbage loopers in the cabbage, cauliflower and Brussel’s sprouts was achieved by spraying weekly with Matador, Decis or Sevin – with Spinosad used as the crops approached harvest maturity.

All crops were harvested as they reached maturity, counted and weighed and then evaluated based on local grading standards.

2016 Growing Season

Fall of 2015 was very long and warm, with minimal snow through until the New Year. The Spring thaw came early and the plots were ready to work by late April. Seeding of the cold adapted crops began in early May, which is well ahead of normal for this site. The last spring frost (-2C) occurred on May 13 which is about a week earlier than average. Dry conditions coupled with above normal temperatures in May and June got the crops off to a quick start. August and September of 2016 were cooler and wetter than normal. A -2C frost on September 21 damaged the tops of the cold-sensitive crops. A heavy snow event in early October followed by several weeks of cloudy, cold weather stopped any further growth of the late season crops and interfered with harvest activity. The first hard frost (-5°C) occurred October 12.

WEATHER DATA							
	May	June	July	Aug.	Sept.	Oct.	Season
	Growing Degree Days (base 5°C)						
Saskatoon 2016	261	370	424	368	201	12	1636
<i>Long-Term Average</i>	225	349	440	406	223	10	1653
	Mean Temperature (°C)						
Saskatoon 2016	13.7	17.4	18.7	16.9	11.8	2.1	13.4
<i>Long-Term Average</i>	12.4	16.6	19.1	18.0	12.2	5.3	13.9
	Frost Free Season						
Saskatoon 2015	May 13 to Sept. 21 = 129 days						
<i>Long-Term Average</i>	117 days						

Insects/Diseases/Other Pests

Insect and disease pressure were fairly typical in 2016. As usual, root maggot pressure was very high. The Lorsban drenches provided an acceptable level of maggot control in the Brussels sprouts trial. In the cauliflower and cabbage trial which tested efficacy of a range of maggot control products, a significant portion of the untreated control plants were lost to root maggots. Looper pressure was milder than in previous seasons. Populations of corn stem borer and corn earworm continue to increase across Saskatchewan. Stem borers caused fairly extensive damage to the fruit of peppers in the open field and high tunnel trials. The efficacy and economics of spraying for this pest in peppers should be considered going forward.

Spider mites have been a consistent problem on the raspberries and strawberries grown in high tunnels – and were a problem again in 2016. Mite problems were observed much earlier in the growing season than normal (mid-June) – this reflects the early onset of the warm dry conditions that are conducive to mite development. An overhead mist system was set up in the high tunnel to deliver 1 minute of mist to the leaves 4 times/day. While the mist appeared to help with the mite problem, some feeding damage was observed on the foliage of all of the raspberry cultivars grown in the high tunnel. The mite problem peaked in early July – which coincided with harvest of the floricanne type raspberry cultivars being tested in the high tunnels. This made it impractical to use insecticides to control the mite problem. With the onset of cooler, cloudier weather in mid-August the mite problem began to subside and the damaged plants rapidly recovered. The primocane type cultivars produced exceptional yields of high quality fruit through until mid-October.

Spider mite populations also exploded on the leaves of the eggplant crop in late August – but by that time the crop was already winding down.

The most damaging disease issues observed in 2016 were on the lettuce – with the head lettuce appearing to be much more prone to disease than the romaine. Basal rot (*rhizoctonia*) caused significant losses at all planting dates in both direct seeded and transplanted romaine and head lettuce crops. Some drop (*sclerotinia*) was also seen in the head lettuce but did not cause problems in the romaine crops. The incidence and severity of both of these diseases increased rapidly as the crops approached harvest maturity. Plant loss and/or grade out to disease approached 100% in many of the head lettuce trials. Soil and foliar applied fungicides showed little efficacy against these persistent soil-borne diseases. However, transplanting the lettuce through plastic mulch did appear to reduce the incidence and severity of both of these diseases.

Voiles caused some minor damage late in the season to the Brussels sprouts and peppers. Deer caused extensive damage to the head and romaine crops. Various chemical repellants (soap, mothballs, hot pepper, garlic) were tested against the deer but had no apparent efficacy. Keeping the lettuce covered with bird netting from emergence through until harvest did protect against the deer – but the netting interfered with maintenance of the crop.

Notes on Performance of Crops in 2016.

Asparagus – this trial was established in 2005 using new lines of asparagus accessed from across North America, with the University of Guelph also providing a range of, as yet, unreleased numbered lines. Stand counts revealed that most lines had experienced some loss of stand by the 3rd year after planting, with some additional losses in 2008/2009, but little in the way of additional losses through 2016. Yield performance of the various lines has been tracked since 2008. The trial was harvested 3 times/week for 8 weeks in 2016. Spears were weighed and graded for quality. An early start to harvesting combined with warm conditions through the harvest period resulted in marketable yields in 2016 being higher than in any previous year of testing. The asparagus plot appeared healthy throughout the 2016 growing season.

Celery – the celery crop was established (18 cultivars) using 8 week old greenhouse-grown seedlings. The celery seedlings were quick to resume growth after transplanting. All of the cultivars tested tolerated application of Lorox for weed control. Favorable growing conditions throughout the 2016 growing season resulted in excellent growth, yields and quality. The crop reached marketable size by mid-August which is about a week earlier than normal. By the mid-September harvest, the stalks had reached full length (avg of 34 cm) – but the heads continued to increase in weight through to the final harvest in mid-October. As the heads grew, more extensive trimming was required to achieve the standard “celery heart”. Finding a market for the trimmed stalks would increase profitability of celery production. Quality was excellent at all harvests, with most cultivars producing bright green juicy stalks with a mild sweet flavor. However, blackheart was a major issue in most cultivars. Blackheart is caused by the calcium shortages that occur when the celery crop encounters non-uniform growing conditions. While careful attention to irrigation, fertility, and plant populations may reduce problems with blackheart, selection of blackheart resistant cultivars likely represents the most dependable approach to managing this problem. No significant insect or disease problems were observed in the 2016 celery crop. Fewer than 1% of the celery plants developed aster yellows.

Dill weed – two plantings were conducted (May 6 and June 9) but there was insufficient seed available to test all of the cultivars at the 2nd planting. Both plantings emerged quickly – but the overall stand achieved was better at the 1st planting than at the 2nd. This may reflect drier field conditions in June. The stand % also varied greatly amongst the cultivars. The seed of the DH series cultivars developed by the U of S was quite old – which could explain its low germination rate. While the herbicide Lorox is registered for use in dill – it has the potential to cause crop damage, depending on the rate applied, the growth stage of the crop, the cultivar being treated and prevailing weather conditions. Most cultivars showed a brief checking of growth and some marginal burn to the leaves following exposure to the Lorox. Some cultivars (ie; Dukat and Green Sleeves) appeared quite resistant to the herbicide – while others (Fernleaf and Ella) stopped growing for an extended period after treatment. The dill was harvested as soon as the plants started to bolt prior to flowering.

NB – the pre-harvest period for Lorox applied to dill is 60 days. Waiting until the dill has emerged before treating with Lorox will not leave enough pre-harvest interval if the crop is to be harvested as dill weed. Instead the Lorox should be applied after planting but prior to emergence of the dill crop.

Eggplants – six week old greenhouse-grown transplants were used to establish this trial. High quality seedlings of 40 cultivars of eggplant were planted through black plastic mulch in late May. The rows were covered the next day with a green perforated polyethylene row cover. Consistent favorable conditions in May and June allowed the eggplant crop to quickly establish. The first eggplant fruit were ready to harvest by late July and the crop was harvested weekly from then until early October. No problems with disease or insects were noted in the 2016 eggplant crop. Yields were exceptionally high. Crop quality was also generally good – although many fruit showed minor surface damage due to scratching by the leaves of the eggplant crop.

Yellow Onions – this was the 4th year of testing of direct seeded yellow onions. An early thaw allowed the 2016 onion crop to be planted in early May into excellent field conditions. The crop emerged quickly and the resulting stand was excellent in most cultivars. Quick and uniform emergence of the crop allowed for early use of herbicides for weed control. No problems with disease or insects were observed in the 2016 onion crop. Generally favorable weather conditions throughout the growing season resulted in early sizing of the crop – and all of the cultivars had reached full maturity by harvest in late September.

Peppers –greenhouse-grown transplants of 63 different bell pepper cultivars were used to establish this trial. However, growth and development of the pepper seedlings were delayed by feeding damage caused by heavy thrip populations in the greenhouse. Consequently, the pepper seedlings were weak and stunted when transplanted into the field in late May. The peppers were transplanted into black plastic mulch and were kept covered with perforated green polyethylene row covers for the first 6 weeks of the field season. Consistent favorable conditions in May and June allowed the pepper crop to quickly recover from the damage done by the insects in the greenhouse. The first fruit reached marketable size by mid-August and the crop was harvested every 2 weeks from then through until the first killing frost in late September. No problems with disease were noted in the 2016 pepper crop. Yields were exceptionally high. Crop quality was also generally good – although some fruit were damaged by corn borers and feeding damage by voles became a problem in the later harvests. In most of the cultivars tested only a small fraction of the fruit turned color before fall frost

Romaine lettuce - the romaine crop was established by either direct seeding or by transplanting. Getting the direct seeded romaine crop to emerge uniformly was a consistent problem. Some cultivars were clearly more vigorous than others but only a few of the Romaine cultivars tested consistently produced a quality stand. By contrast, Romaine transplants were very easy to grow in a greenhouse and transplant into the field. It took about 3 weeks to grow the seedlings to the size that was ready to go to the field (ca 10 cm tall). Using larger/older plants increased problems with transplant shock. No insect problems were observed in any of the romaine crops. However grade out to tip-burn was a common problem – especially if the heads were allowed to grow to full size. Problems with tipburn were unfortunately most common amongst the faster growing, high yielding cultivars. Deer also damaged all of the crops - and for the 3rd planting the damage was so severe that no useful data could be collected. The deer appeared to avoid the purple-leaved cultivars of Romaine. No significant insect or disease problems were observed in any of the Romaine crops. Crop growth slowed dramatically after mid-September and the 4th transplanting failed to mature before the end of the field season.

Head lettuce - the head lettuce crop was established by either direct seeding or by transplanting. Getting the direct seeded head lettuce crop to emerge uniformly was a consistent problem. Some cultivars were clearly more vigorous than others but only a few cultivars consistently produced a quality

stand. By contrast transplants of head lettuce were very easy to grow. It took about 4 weeks to grow the seedlings to the size that was ready to go to the field (ca 10 cm tall). Using larger/older plants increased problems with transplant shock. No insect problems were observed in any of the head lettuce crops. However, plant losses to drop (caused by sclerotinia) and cullage due to basal rot (caused by rhizoctonia) were common problems in all the head lettuce cultivars tested and at all planting dates. Grade out to tip-burn was also a common problem – especially if the heads were allowed to grow to a large size. Deer also damaged all of the plantings of head lettuce - and the 3rd transplanted crop was so severely damaged that no useful data could be collected. Crop growth slowed dramatically after mid-September and the 4th transplanting failed to mature before the end of the field season.

Cultivar Recommendations for 2016

Asparagus –Guelph Millennium, Arianne and UG 005 were the top performing asparagus cultivars in 2016. These lines combined good stands with high yield/plant of marketable spears. **Cumulative yields of Guelph Millennium over the past 9 harvest seasons (2008-2016) are now 64% greater than the average of the 25 asparagus cultivars included in this trial.** Over the past 5 seasons UG 005 has consistently produce excellent yields with a very high % of marketable spears. Cumulative yields of Guelph Thiessen are also high, although the yield potential of this cultivar seems to vary from year to year. Arianne has also produced consistent high yields, but the spear size of this cultivar is larger than typically seen in most markets.

Brussels Sprouts – favorable growing conditions resulted in excellent yields and quality for most cultivars at both harvest dates (Sept. 12 and Oct. 20). **Brilliant, Diablo** (previously recommended) and **Divino** produced good yields at both harvests of uniform-sized, dense sprouts which were easy to remove from the stalks.

Celery - Most of the celery cultivars tested in 2016 produced excellent yields of high quality heads. Major differences amongst the cultivars occurred in the amount of trimming that was required to achieve a standard heart type head. While some blackheart was seen in all the cultivars, some appeared to be more susceptible/resistant than others. **Kelvin** produced outstanding yields at all harvests. It also had little blackheart and required minimal trimming. **Picador** produced good yields and had the lowest % blackheart of any of the cultivars tested, however because of heavy side-branching it required substantial trimming to produce a marketable head. **Tango** and **Victoria** which had been recommended in previous trials again performed well in 2016.

Dill weed – the cultivars were evaluated for stand %, uniformity of growth, bolting and yield of tissue suitable for use as dill weed (leaves and fine stems) for two planting dates. The flavor was evaluated but not rated, as opinions on flavor are highly subjective. Both plantings reached harvest maturity at about 50 days after planting. By the time the plants had reached a harvestable size, some cultivars had started to bolt – this increased the amount of course stem material which is undesirable as it must be graded out. Bouquet and Hera were slower to bolt. The first planting of Dukat produced exceptional yields – but the stand and yields for the 2nd planting were very poor. **Diana** and **Bouquet** produced good yields of high quality leaves in both plantings. While the yields of Diana are higher than Bouquet, it is more prone to bolting and produces more stem material that must be graded out. Hercules and Tetra Goldkrone both performed well at the single planting date tested.

Eggplant - Favorable growing conditions throughout the 2016 growing season resulted in excellent yields and quality in the eggplant trial. **Epic** (previously recommended), **Galine** and **Traviata** all produced exceptional yields of the standard globe-shaped dark-purple to black fruit. The fruit of Epic are very large which may be a positive or negative attribute, depending on the market. The performance of the speciality type cultivars of eggplant was less impressive. **Black Moon** produced good yields of light purple fruit – but the fruit were variable in size and shape. **Clara** produced good yields of large white skinned fruit but it had a low germination % and the fruit were prone to scarring. None of the standard sized variegated cultivars could be recommended – but **Fairy Tale** produces huge numbers of small, uniform purple/white variegated fruit that are very easy to harvest. **Apple Green** produced good yields of round, green skinned fruit – but the green color was not popular amongst consumers as it made it difficult to assess maturity of the fruit. None of the long Asian type eggplant cultivars tested performed well – their yields were low and many produced a high percentage of fruit that were too curved to be marketable.

Green Onions – stand establishment was the primary difference amongst the green onion cultivars tested. **Evergreen Long White Nebuka**, **Long White Bunching** (previously recommended) and **Parade** all produced a very thick stand, of tall straight attractive stalks. None of the spring type onion cultivars tested could be recommended – primarily because none of them produced a good stand.

Head lettuce – while yields of all plantings of the direct seeded and transplanted head lettuce crops were quite good, the quality was generally poor. A high % of the heads were culled due to tipburn and disease. Once mature, the heads showed little potential to hold their quality in the field for more than one or two days. Head size and density in this trial did not approach the quality seen in imported head lettuce. In the direct seeded trials, **Pacesetter** and **Prestige** provided the best combination of good stand establishment, yields and head quality. In the transplanted crops, **NIZ 44-4402** and **Templin** were the top performers. It is noteworthy that none of the cultivars recommended when direct seeded performed well if the crop was transplanted – and visa-versa. None of the cultivars that were recommended the last time head lettuce cultivars were tested (2001) performed well in 2016.

Onions – in this 4th year of testing of direct seeded onions, favorable conditions at seeding time resulted in an excellent stand for most cultivars. A good stand coupled with good conditions throughout the 2016 growing season resulted in exceptional yields and quality. Almost all of the cultivars tested in 2016 reached full maturity by the time of harvest in late September. **Sedona** (previously recommended) was clearly the best yellow-type onion tested. It combined a good stand with very large average bulb size – but it is not an early maturing cultivar. While **Sedona** is classified as a Spanish-type onion, it has quite a strong flavor and stores well. **Red Hawk** produced exceptional yields of high quality red onions. The top performing white onions (**White Wing** and **White Sweet Spanish**) were almost as early and high yielding as the more adapted yellow types.

Peppers – favorable growing conditions resulted in excellent fruit yields and quality in the 2016 pepper trial. While using microclimate enhancing mulches and covers obviously accelerated growth and development of the 2016 pepper crop, only a few cultivars could be regarded as “early” – meaning that a significant proportion of the fruit had turned red before fall frost. **Double Up**, **Early Summer**, **King Arthur** (previously recommended), **Redstart** (previously recommended) and **Thickset Improved** produced good overall yields with a significant portion of the fruit maturing to red prior to frost. **SVR 1819** produced exceptionally high yields – but the fruit were slow to turn from green to red.

Romaine Lettuce – in both the direct seeded and transplanted romaine lettuce crops, yields and quality of the first two plantings were excellent. The 3rd transplanted crop was severely damaged by deer and the 4th transplanted crop failed to mature prior to fall frost. In the transplanted trials, several of the cultivars that had been recommended in previous trials (**Early's Romaine**, **Green Towers** and **Parris Island**) also performed well in 2016. **Valley Heart** and **Vivian** also did well. All the recommended cultivars produced large uniform upright heads with good color and minimal defects. Several of the cultivars that performed well when transplanted also did well if direct seeded (Vivian, Green Towers and Early's Romaine). **Salvius** and **Green Forest** also did well when direct seeded. **Darlene** was also recommended when direct seeded – it produced exceptional yields of good tasting heads, but the heads were more open than is typical for romaine type lettuce.