



VEGETABLE CULTIVAR AND CULTURAL TRIALS 2015

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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 good field conditions in mid-October of 2014.

The direct-seeded cauliflower, onion, pea and romaine lettuce crops tested in 2015 were seeded in 6 or 8 m long rows 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 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.

Cauliflower – single row with plants spaced 30 cm apart and rows 1.25 m apart

Directed seeded crops

Onions – double row spaced 15 cm apart with 10 cm between plants within a row and rows spaced 0.5 m apart

Peas – single row with seeds spaced 5 cm apart within the row and rows spaced 1m apart

Cauliflower - single row with plants spaced 30 cm apart and rows 1.0 m apart

The celery (8 week old), cauliflower (6 week old) and romaine lettuce (4 week old) transplants were grown in a greenhouse but were acclimated to outdoors conditions for a few days prior to being transplanted in the field. A Waterwheel type transplanter was used for all transplanted crops.

The following products were used for weed control;

Asparagus - Sencor applied prior to harvest. Lorox applied after harvests completed.

Cauliflower – Treflan applied prior to planting. Lontrel applied mid-season.

Garlic and Onions – Chateau applied before crop emergence. Buctril and Poast applied to the garlic when it was 10 cm tall. Goal applied to the onions in mid-June and again in mid-July.

Peas – Treflan applied prior to seeding

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 (celery, romaine lettuce).

Just after emergence of the direct seeded cauliflower crop, Lorsban was applied as a soil drench for control of root maggots. Lorsban was also applied within a week of establishing the transplanted cauliflower crop in the field. Control of cabbage loopers was achieved by spraying weekly with Matador, Spinosad, Decis or Sevin.

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

2015 Growing Season

Winter of 2014/2015 was near normal for temperatures and precipitation. There were no mid-winter thaws and adequate snow cover was present throughout the winter to protect fall planted and perennial crops. Spring melt came early and in the absence of significant rainfall the fields were ready for planting by early May. A -3C frost event occurred on May 29 which is about 10 days later than the normal date of the last spring frost. Some early planted/transplanted crops were damaged by this frost event. Very little rain occurred from May through mid-July. The lack of rain coupled with abnormally warm temperatures made it very difficult to get seeded crops to germinate or to establish transplants – even in situations where irrigation was available. Temperatures and rainfall patterns from mid-July onwards were closer to normal. The problem with excessive humidity encountered during late summer of 2013 and 2014 was not repeated in 2015. A -1C frost on September 9 damaged the tops of the most cold-sensitive crops but for the remainder of September and most of October temperatures were well above normal. The first hard frost (-5°C) did not occur until October 25.

WEATHER DATA							
	May	June	July	Aug.	Sept.	Oct.	Season
	Growing Degree Days (base 5°C)						
Saskatoon 2015	158	366	446	384	207	53	1614
<i>Long-Term Average</i>	225	349	440	406	223	10	1653
	Mean Temperature (°C)						
Saskatoon 2015	10.1	17.2	19.4	17.4	11.9	6.7	13.8
<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 29 to Sept. 9 = 103 days						
<i>Long-Term Average</i>	117 days						

Insects/Diseases/Other Pests

Insect and disease pressure were fairly typical in 2015. Although root maggot pressure was very high, the Lorsban drench provided an acceptable level of control in the cauliflower trial. Regular spraying was required to maintain control of loopers in the cauliflower crop – as populations of this pest were high for an extended period. Levels of corn stem borer and corn earworm damage continue to increase across Saskatchewan. No pesticides were used in the 2015 corn plot and some grade out to earworms occurred in the early cultivars. Stem borers also caused extensive damage to the fruit of peppers in the high tunnels. The long cold winter coupled with limited populations in the previous year resulted in Colorado potato beetles being a non-issue in 2015.

Spider mites have been a consistent problem on the raspberries and strawberries grown in high tunnels – and mites were particularly severe on the high tunnel raspberries in 2015. By the time the spider mite problem reached its peak in July, some of the raspberry cultivars were almost completely defoliated. As the mite attack coincided with the harvest period in the florican type raspberry and the June-bearing strawberries, efforts to control the mites were limited to spraying the foliage with water and lifting the sides of the tunnel to increase air flow. By mid-August the mite problem had subsided and the damaged strawberry and raspberry plants rapidly recovered, producing exceptional yields through until mid-October.

Unusually high humidity levels experienced through much of the 2013 and 2014 growing season had been conducive to the development of foliar diseases – especially within the warmer growing environment of the high tunnels. As 2015 was much drier than the previous years, few problems with disease were observed in any of the test crops.

Voles had caused major damage to crops in the high tunnels and open field trials in previous years. However in 2015 the vole population crashed and minimal damage occurred in any of the crops. Deer destroyed the 3rd and 4th transplanted crops in the romaine lettuce trial.

Notes on Performance of Crops in 2015.

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 2015. Yield performance of the various lines has been tracked since 2008. The trial was harvested 3 times/week for 7 weeks in 2015. Spears were weighed and graded for quality. Marketable yields in 2015 were slightly lower than in 2014 – likely because warm weather during the 2015 harvest period caused more spears to be graded out as over-mature. The asparagus plot appeared healthy throughout the 2015 growing season.

Cauliflower – consistent dry conditions following seeding resulted in a complete failure of the direct seeded cauliflower trial. Less than 1% of the seeds planted emerged – even following repeated irrigation. The cauliflower trial was therefore re-seeded on June 7. Again the resulting stand was poor – even though the plot area was kept moist through the germination period. Averaged across the 41 cultivars tested, the average stand in the 2nd direct seed trial was only 39%. Problems with stand establishment could not be attributed to problems with seed quality – as almost all of the lines tested had showed a high germination % when seeded out in the greenhouse for the transplanted trial. A few of the lines also produced nearly a 100% stand in the 2nd direct seeded trial – these lines clearly have enhanced ability to handle stress. The transplanted cauliflower trial was planted into the field on May 21. Conditions following transplanting were favorable and the crop looked good until May 29 when it was hit by a -3C frost. The amount of damage this frost event caused was surprising as cauliflower is considered to be relatively cold tolerant. However as growing conditions prior to the frost event had been favorable – the seedlings were not cold acclimated – and so were susceptible to damage. In some areas of the field the duration and severity of the frost event were sufficient to kill the cauliflower seedlings – while in other areas just a few leaves were damaged and those plants eventually recovered from the frost event. On

average the transplanted cauliflower crop was ready for harvest almost 2 months earlier than the direct seeded crop. This obviously reflects the delay getting the direct seeded crop established. As has been seen in previous years of testing, the transplanted cauliflower crop was also more uniform in time to maturity than the direct seeded crop. However, the direct seeded crop produced higher yields and larger heads than the transplanted crop. Head quality was slightly better in the transplanted crop. The delay in getting the direct seeded crop established meant that some of the late maturing cultivars failed to completely mature prior to the termination of harvest in late October.

Garlic - The garlic crop was planted in the fall of 2014 into good field conditions. Cloves were planted by hand while a standard push type planter was used to plant bulbils. Two weeks after planting the test plot was covered with a 20 cm deep layer of hay. As the winter of 2014/2015 was cold it is likely that the trial would have experienced significant over-winter damage if it had not been mulched. The straw mulch was removed just after the snow melted in late April – prior to any plants emerging. Prior to emergence of the first garlic plants, the plot was sprayed with the herbicide Chateau. A stand count conducted in early May showed that most of the cultivars established using cloves as the planting material had successfully over-wintered. Plants established by planting bulbils were much slower to emerge and produced a weaker stand than when cloves were planted. On May 23 the plot was sprayed with Buctril and 2 days later with Poast as weed populations were becoming a problem – particularly in the slower emerging rows planted to bulbils. While both Buctril and Poast are presently registered for weed control in garlic, all of the garlic plants developed severe symptoms of herbicide damage within a few days of treatment (see Fig. 1) and they all eventually died. By contrast, most of the weeds appeared to be relatively unaffected by the herbicide treatment. The cause of this problem could not be ascertained. While over-application of the herbicides was a possibility – the fact that the weeds were not affected by the treatment would suggest otherwise.



Fig 1. Herbicide damage to the 2015 garlic crop.

Exceptionally warm conditions following application of the herbicides could have increased the potential for crop damage. No yield data could be collected from this trial.

Yellow Onions – this was the 3rd year of testing of direct seeded yellow onions. An early thaw allowed the 2015 onion crop to be planted in early May. However, exceptionally dry conditions following seeding interfered with establishment of the crop – some seedlings emerged quickly – while others were still emerging weeks later. Uneven emergence of the onion crop made it difficult to use herbicides for weed control as most of the herbicides registered for use in onions have a narrow window of crop safety. Considerable supplemental hand weeding was required in this trial. No problems with disease or insects were observed in the onion crop. Favorable weather conditions in late summer through September allowed the crop to catch up – at least to some degree. However very few of the cultivars tested were fully mature when harvested in early October.

Peas – an early snow melt and limited spring rainfall allowed the 1st pea trial to be planted out in early May. The second planting went in 5 weeks later. Only a few cultivars produced a good stand at both planting dates. Yields were similar for the two planting dates. Powdery mildew was widespread at both planting dates – and none of the cultivars tested showed an economically useful degree of resistance to this disease problem.

Bell Peppers – eight week old greenhouse-grown transplants were used to establish this trial. High quality seedlings of 59 cultivars of bell pepper were planted through black plastic mulch on May 25. The rows were covered the next day with a green perforated polyethylene row cover. While the weather prior to, and immediately following, transplanting the peppers had been exceptionally favorable, on the night of May 28/29 temperatures dropped to -3C. As the peppers had not yet had a chance to acclimate to field conditions, over 95% of the seedlings were killed by this frost event. As has been seen in other trials, the row covers provided little in the way of frost protection. This trial was terminated at this point.

Eggplants – six week old greenhouse-grown transplants were used to establish this trial. High quality seedlings of 43 cultivars of eggplant were planted through black plastic mulch on May 25. The rows were covered the next day with a green perforated polyethylene row cover. While the weather prior to, and immediately following, transplanting the eggplants had been exceptionally favorable, on the night of May 28/29 temperatures dropped to -3C. As the eggplants had not yet had a chance to acclimate to field conditions, frost damage to the seedlings was extensive – although the degree of damage was not as severe as seen in the peppers. While the tops of the plants were frozen off, a basal bud often survived – especially if the bud was either at or below the soil surface. Many plants eventually regrew from this basal bud – but crop development was delayed to the point where no useful yield data could be collected.

Celery – the celery crop was established in the 1st week of June using 8 week old greenhouse-grown seedlings. The celery crop was slow to establish after transplanting but thrived from July onwards. No significant disease or insect problems were observed in the celery crop and no pesticides were applied. The warm, wet conditions experienced in late summer and into the fall of 2015 were near-ideal for celery. By mid-August the crop had achieved market standards for stem length. Plant size and quality continued to increase through September and marketable quality heads could still be harvested into early November, even after several -5C frosts.

Romaine lettuce - the romaine crop was established by either direct seeding or by transplanting. Four week old greenhouse-grown seedlings were used to establish the transplanted crops.

Direct seeded : 3rd week May and 4th week June

Transplanted : 3rd week May, 4th week June, 4th week July and 4th week August

Getting the direct seeded romaine crop to emerge uniformly was a consistent problem. Some cultivars were clearly more vigorous than others but few cultivars consistently produced a quality stand. Lettuce transplants were very easy to grow. It took about 3 weeks to grow the seedlings to the size that was ready to go to the field (ca 10 cm tall). Larger seedlings were more prone to transplant shock. Transplant shock was an issue when the crop was being transplanted under hot conditions in mid-summer. No disease or 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 a large size. Deer damaged the 3rd and 4th transplantings of the romaine to the point where no useful data could be collected. Crop growth slowed dramatically after mid-September.

Cultivar Recommendations for 2015

Asparagus –Guelph Millennium was by far the highest yielding cultivar in 2015, followed by **Arianne, UG 005, and Guelph Thiessen**. The highest yielding lines combined good stands with high yield/plant of marketable spears. **Cumulative yields of Guelph Millennium over the past 8 harvest seasons (2008-2015) are now 61% greater than the average of the 25 asparagus cultivars included in this trial.** After getting off to a slow start, UG 005 has begun to 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.

Cauliflower – in this 2nd year of testing the performance of each cultivar was evaluated in both direct seeded and transplanted crops. As explained above, the direct seeded crop had to be re-seeded, as the first planting failed due to drought. The transplanted crop was also damaged by a late spring frost. **Symphony** (previously recommended) was the only cultivar that produced superior yields and quality in both the direct seeded and transplanted trials. **Fargo, Klamath, Sparrow, Stabilus** and **Terzolo** could all be recommended based on their performance in the transplanted trial. Terzolo and Stabilus had performed well in previous tests. **Denali** and **Flamenco** were early enough that they performed well even when direct seeded very late in the season.

Yellow Onions – in this 3rd year of testing of direct seeded yellow onions, unfavorable conditions at seeding time reduced the stand on some cultivars and delayed development of other. The combination of poor stand and small bulb size reduced yields in 2015 relative to previous years of testing. The 2015 crop was also less mature at harvest than in previous years – and that would reduce its storage potential. Many of the late season cultivars which had performed very well in previous years (ie; Anillo and Madras) performed poorly under the less favorable growing conditions experienced in 2015. **OLYX08-640** (previously recommended) produced outstanding yields of large high quality bulbs in the 2015 trial. **Crockett** (previously recommended) was early maturing and produced excellent yields but the average bulb size was relatively small. **Tamara** (previously recommended) was also early maturing and produced good yields, while **Prince** produced a high % of large marketable bulbs.

Celery – the celery cultivars tested in 2015 represent only a small fraction of the choices available. All of the cultivars tested produced marketable sized heads by mid-August and were still producing marketable heads through until early November. 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. Two previously recommended cultivars, **Tango** and **Victoria**, as well as **Utah 52-70** all produced excellent yields of long, crunchy, mild flavored stalks.

Peas – peas were seeded in early May of 2015 and again 5 weeks later. Average yields were similar for the two planting dates. **Maestro** was the only cultivar that produced well at both planting dates and also had good quality. **Encore** and **Bolero** (previously recommended) yielded well but their quality was only average. **Sienna** was rated as exceptional in all of the quality parameters evaluated.

Romaine lettuce - tipburn and bolting reduced marketable yields in the first planting of both the direct seeded and transplanted romaine crops. Both of these problems showed up late in the development of the crop. This type of grade out was substantially reduced in the second planting by simply harvesting a few days earlier. **Jericho** (previously recommended) produced the highest yields in both of the direct seeded trials. Jericho produces large but somewhat open light green heads. While Jericho appears to be quite susceptible to tipburn, this problem can be largely avoided by timely harvest. **Early's Romaine** produced excellent yields with a high marketable % in both transplanted trials and it also performed well when direct seeded. Early's Romaine produces a tight head which can easily be trimmed to meet “hearts of romaine” specs. Its flavour was rated as only average. **Breen** was consistently rated as the best tasting cultivar in the trial, followed by Jericho and **Darlene**.