

## Celery Production Trial

**The objective was to determine yield and quality potential for SK-grown celery.**



The project was conducted at the University of Saskatchewan - Horticulture Field Research station in Saskatoon. The site features a Sutherland Series clay loam soil (pH 7.8, E.C.< 1.0dS/m). Clay soils are fairly well suited for celery production as they will provide the abundant nutrients and water required by the crop. Due to the long history of vegetable production at this site, the soil tests very high for most required nutrients (> 400 kg P<sub>2</sub>O<sub>5</sub>/ha and > 1000 kg K<sub>2</sub>O/ha) and only limited applications of N fertilizer are required in each year. Every 4 years about 10 T/ha of composted cattle manure is added to the site in an effort to enhance the soil organic matter content. This manuring adds to the already abundant nutrient supply at the test site. The site is protected by a well-established shelter-belt system.

The specific area used in the 2015 celery production project had been cropped to cauliflower in 2014. In spring of 2015 the plot area had been fertilized by broadcasting sufficient 46-0-0 (urea) to raise total soil N levels (residual + applied) to 125 kg N/ha. The field was then rotovated to a depth of 15 cm to incorporate the fertilizer and prepare a suitable seedbed.

The celery cultivars tested in 2015 were selected for ease of seed availability and demonstrated suitability based on previous U of S trials. Many more cultivars of celery are available.

Transplants were started in the 3<sup>rd</sup> week of March in 72 cell transplant trays filled with standard peat-based soilless media. Celery seed is small and light – making seed singulation difficult. Celery seed must be kept consistently moist (not wet) though the germination period. Greenhouse conditions were 24C day/18C night with 10 h/day of supplemental HPS light (100 umol). It took 2 weeks to get a significant portion of the seeds to germinate. The plants were thinned to 2 seedlings/cell once the plants were at the 1 true leaf stage and down to 1 plant/cell once the plants had 3 true leaves. Starting one month after seeding, the transplants were fertilized on a weekly basis with 400 ppm N as 20-20-20+ micronutrients. The seedlings were ready for transplanting by the 4<sup>th</sup> week of May (9 weeks after seeding) – by which time the risk of frost had largely passed. A Waterwheel type transplanter was used to set the seedlings 30 cm apart within the row (closest in-row spacing for that transplanter) in twin rows spaced 30 cm apart – with 1.25 m between twin rows to allow tractor access. The seedlings were watered in with 100 ppm 10-52-10 and were irrigated within 4 hours of the transplants being set in the field.

The crop was top-dressed with 20 # N/a in the 1<sup>st</sup> week of July, the 1<sup>st</sup> week of August and again in the 1<sup>st</sup> week of September in an effort to promote rapid, lush crop growth.

While there are several herbicides approved for use in celery - weeds were controlled in the test plot by rotovating between rows and hand weeding within the rows. Weed control was required through mid-July as the crop grew slowly until then – but once the crop had produced a complete canopy it out-competed all weeds.

Overhead irrigation was applied 1-2 times/week in order to maintain the moist soil conditions preferred by celery. No significant disease or insect problems were observed in the 2015 celery crop and no pest control measures were employed.

**2015 Growing Season** - June and July were exceptionally warm and windy, with next to no rain. August was more moderate with averaged amounts of rainfall. By the first week of September night time temperatures were dropping into the single digits. On Sept. 9 temperatures dropped to -1C and some frost damage was observed on cold sensitive crops – but not on the celery. On Oct. 4 night time temperatures dropped to -5C – resulting in extensive damage to all cold sensitive crops – but no damage was observed in the celery. Temperatures did not go below -5C through until early November of 2015.

**Crop Performance** – All of the cultivars tested produced fairly vigorous seedlings. While almost all of the seedlings survived the transplanting process, it took several weeks for them to start growing again. The hot dry, windy conditions following transplanting were hard on the celery seedlings (Fig. 1). By mid-July the crop was thriving. By the 2<sup>nd</sup> week of August the plants had reached marketable size and a sample harvest was taken. In the 3<sup>rd</sup> week of September a major harvest was taken. At this harvest some plants in some cultivars had developed black heart (Fig. 2) – a physiological disorder caused by erratic uptake of calcium. By early October, the short days and cool conditions had slowed crop growth – but marketable quality heads were still being harvested through until early November.



**Fig. 1. Celery plants showing signs of transplant shock after 3 weeks in the field.**



**Fig. 2. Celery with black heart disorder.**

### **Yields**

Aug. 15 harvest

At the spacing used in the trial – get 6.6 plants/m<sup>2</sup> or 66,000 plants/ha or 26,000 plants/a

Best cvs yielded heads weighing 0.7kg **after trimming** = 4.6 kg/m<sup>2</sup> = 46 T/ha (20.6 t/a)

Sept. 15 harvest

Weight of **trimmed heads** has increased to 1.1 kg = 73 T/ha or 32 t/a.

At both harvest dates over 40% of the initial head weight was trimmed away in order to produce the “celery heart” typically in demand in the marketplace. A good portion of this trimmed material was perfectly useful - as long as there was a market for slightly shorter and thinner than normal individual stalks. This material would be ideally suited for use as a chopped product

**Quality** - by the Aug. 15 harvest all of the cultivars tested consistently produced heads that exceeded Canada No 1. Grade standards for height (12”(30 cm) stalks) and diameter (2.5” (6 cm)). The stalks did not get much taller by the Sept. 15 harvest – instead the stalks got thicker and juicier, and the heads produced far more side stalks. None of the side stalks grew large enough to be marketed as separate heads.

The appearance of most of the cultivars was good – except for cv. Self-Blanching which was an unattractive mottled yellow. This cultivar is designed to address markets that expect a blanched product – but demand for this type of celery is limited in SK. Tango had a particularly attractive bright green color.

The CFIA Grade standards mention a number of defects commonly seen in celery (stem cracking pithiness, leaf blight, brown spot, yellowing etc). Aside from the few plants with obvious blackheart or pink rot, none of these defects were observed in the 2015 celery crop.

The flavour of all of the cultivars tested was acceptable – except for Self-Blanching – which was excessively bitter with minimal sweetness. Similarly – the texture of all of the lines tested was acceptable – although it was clear that some of the lines produced stalks which were “chewier” than others.

#### **Variety Assessment (see next page for full table)**

**Tango, Utah 52-70 and Victoria** were the best performing varieties. They all combined excellent seedling vigor, with good yields, large stalk size and acceptable flavour.



**Fig. 3. Victoria, Utah 52-70 and Tango cultivars of celery with untrimmed plants on top and plants trimmed to meet market standards on the bottom.**

**Conclusion** - celery is a “moderately challenging” crop to grow in SK. Getting the transplants to size up enough to be ready for planting by late May will require a good quality greenhouse facility and careful attention to the crop. Celery requires lots of water – making it well suited to sites with a heavier texture soil. Similarly the crop requires a steady supply of fertilizer – especially N. Harvest can begin whenever plants reach the minimum size accepted in the marketplace. In 2015 this threshold was reached by early August – and then harvest can continue through until a hard frost occurs (mid-November in 2015). As the celery plants are fairly uniform – a once-over harvest would be the most efficient approach. Harvest is labor intensive – as simply cutting through the stalks can be a struggle once the plants reach full size – and then significant amounts of trimming are required to meet Grade standards. Harvest aids – such as a conveyor system would be very useful. If a market can be found for the trimmings – it may make more sense to harvest the entire stalk – and then trim it indoor so that the trimmings can be retained. Celery can be stored for 4-6 weeks at 0C and 95% RH.

## Celery 2015

Cultivar	Supplier	Early Harvest (Aug. 10)				Late Harvest (Sept. 14)						Flavor	Overall Rating	Comments
		Trimmed		Petiole length		Initial wt. (kg/head)	Trimmed		% Trim	Petiole length				
		(kg/head)	(t/ha)	cm	CV%		(kg/head)	(t/ha)		cm	CV%			
Conquistador	J	0.4	25.2	37.9	11	1.5	1.0	56.3	34.7	38.7	7	4.0	2.9	Good flavor, slightly sweet. Many side branches
Self-blanching	EFG	0.4	26.3	37.1	14	1.4	0.7	41.6	50.1	36.2	17	1.0	2.9	100% unmarketable. Lots of internal rot. Bland, bitter flavor
<b>Tango***</b>	<b>J</b>	<b>0.7</b>	<b>23.3</b>	<b>44.6</b>	<b>13</b>	<b>1.9</b>	<b>1.2</b>	<b>72.4</b>	<b>35.2</b>	<b>45.9</b>	<b>6</b>	<b>3.0</b>	<b>4.3</b>	<b>Excellent yields. Looks good. Average flavor and a little stringy</b>
Titus	ST	0.4	41.8	52.9	10	1.8	0.9	55.7	48.0	47.4	16	2.0	3.8	Good yields with long stalks. Strong flavor, slightly bitter
<b>Utah 52-70</b>	<b>WSC</b>	<b>0.7</b>	<b>40.6</b>	<b>46.2</b>	<b>8</b>	<b>1.7</b>	<b>1.0</b>	<b>57.0</b>	<b>42.8</b>	<b>43.8</b>	<b>9</b>	<b>4.5</b>	<b>4.6</b>	<b>Good yields. Good flavor, slightly sweet. Uniform length stalks</b>
Utah Green	WSC	0.6	33.7	39.3	7	1.3	0.8	46.1	38.1	32.6	15	3.0	3.4	Slightly sweet.
<b>Victoria***</b>	<b>WSC</b>	<b>0.7</b>	<b>37.4</b>	<b>46.3</b>	<b>12</b>	<b>2.1</b>	<b>1.1</b>	<b>63.7</b>	<b>49.7</b>	<b>41.1</b>	<b>6</b>	<b>3.0</b>	<b>4.6</b>	<b>Excellent yields. Strong, slightly bitter flavor. Nice and crunchy</b>
<b>Average</b>		<b>0.6</b>	<b>32.6</b>	<b>43.5</b>	<b>11</b>	<b>1.7</b>	<b>0.9</b>	<b>56.1</b>	<b>43.0</b>	<b>40.8</b>	<b>11</b>	<b>2.9</b>	<b>3.8</b>	

Recommended previously \*\*\*      Seeding Date: Mar 20      Spacing between row: 1.25 m      Rating: 1-Poor      CV% = (Standard Deviation/Mean) \* 100  
**Bold Recommended in 2015**      Planting Date: June 2      Spacing in row: 0.15 m      5-Good

Overall rating calculated based on the following weighting matrix; 20% for early trimmed yield, 40% for late trimmed yield, 20% for petiole length, 20% flavor