Further Innovations and Expansions for Nova Scotia's Burgeoning Sweet Potato Industry

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1. Introduction

In Canada, sweet potato consumption had nearly doubled between 2007 and 2012, from 0.72 kg/person/year to 1.43 kg/person/year (Timlick 2014). This is in part due to the public perception that sweet potatoes are a healthier option than traditional types of potato. Additionally, the rising popularity of sweet potato fries has introduced this food as a delicious option outside of the usual consumption patterns of only-at-Thanksgiving-and-Christmas. Canada imported approximately $42 million (CAD) of sweet potatoes in 2013, mostly originating in southern US (Industry Canada 2014). Traditionally, sweet potatoes require long, hot growing season, and are sensitive to cold air and cool soils, presenting a short available growing season in Nova Scotia.

Despite the challenging climate, sweet potatoes grow well in Nova Scotia as found in previous work conducted by Perennia and Charles Keddy Farms Ltd in conjunction with Horticulture Nova Scotia (Farm Innovation Project Number FI2013-0016: "Capturing New Opportunity: Development of sweet potato cultivars and production techniques to suit Maritime growing conditions," 2014-2016). There are currently approximately 20 growers of sweet potatoes in Nova Scotia, the majority of whom are small-scale producers. However, Charles Keddy Farm Ltd >30 acres in 2016, making them the largest producer in the province.

Sweet potatoes are a high value crop with gross revenue of $25,000/acre. However, it would take 200-300 acres of sweet potatoes to meet even 50% of Atlantic Canadian sweet potato consumption, thus the industry could grow to be worth $5,000,000 – 7,500,000.

2. Project Objectives

The Project Objectives outlined in the Farm Innovation Program application (File Number: FI2016-004) submitted in April 2016 were as follows:

1. Continue to identify varieties that are uniquely suited to growing conditions in Nova Scotia.
2. Comparison of yield and quality of slips from various points of origin (Nova Scotia, Ontario, US).
3. Determine best management practices (i.e. plant spacing) for the newly released variety V12-445.
4. Explore season extension options for sweet potatoes.

Several trials were conducted in 2016 to meet these objectives:

1.) Testing the suitability of second generation (G2) sweet potato slips under development at Vineland Research Institute, Vineland, Ontario on raised beds using black plastic. **(Objective 1)**

2.) Continued evaluation of promising varieties and third generation (G3) varieties being evaluated at Vineland Research Institute, Vineland, Ontario. **(Objective 1, 2, 4)**
   a. Evaluating a September and an October harvest date
   b. On raised beds with and without the use of black plastic
   c. Evaluating the effects of slip origin

3.) Evaluating the effect of season extension techniques on two varieties of sweet potatoes in Nova Scotia **(Objective 4)**

4.) Evaluating the effect of slip plant spacing on sweet potato yield characteristics. **(Objective 3)**

3. Materials and Methods

3.1. Testing the suitability of second generation (G2) sweet potato slips under development at Vineland Research Institute, Vineland, Ontario on raised beds using black plastic.

All slips were planted in double staggered rows on raised beds measuring 30cm high and 76cm wide. Spacing between plants was 30cm, and spacing between the double staggered rows was also 30cm. Distance from hill centre to hill centre was 1.34m. All beds were covered with 0.9mm black plastic mulch prior to planting. Slips were planted on June 1, 2016. During the course of the growing season, plots were irrigated as needed through drip irrigation. Minimal hand weeding was performed, as needed.

Each plot consisted of 20 plants for a plot length of 3m. Thirteen varieties were tested, with Covington and Orleans as industry standards for a total of sixteen treatments, with four replicates of each.

Table 2. Varieties in G2 trial

G2 Varieties*	Industry Standards (Comparison)
V14.G164	Covington
V14.D155	Orleans
V14.E246	
V14.G209	
V14.E217	
V14.E061	
V14.F079	
V14.D179	
V13.L105	
V14.D178	
V14.D195	
V14.D160	
V14.D180	

** All G2 varieties originated from the sweet potato variety development program at Vineland, Ontario.*

Data was collected on 12-October-2016. Four consecutive plants (two from each staggered row) were dug in each plot (harvested area = 0.804m²) and each individual tuber was weighed and length measured. Tubers were classified into size based on diameter into three classes: Size 2 (2.5”-3” diameter or “baggers”), Size 3 (3”-3.5” diameter, US #1), and Size 4 (>3.5” diameter, Jumbo). Anything that was smaller than 2.5” in diameter was counted and a total weight was given for “smalls”.

3.2. Continued evaluation of promising varieties and third generation (G3) varieties being evaluated at Vineland Research Institute, Vineland, Ontario on raised beds with and without the use of black plastic.

Cultivars from Vineland Research Institute sweet potato program were trialed on Charles Keddy Farms in Woodville, NS. Two of the varieties (V12B.456, V12B.445) have been performing strongly for the last three years and two more promising varieties were added (V13E.097 and V13D.114) based on results from 2015 trials. Additionally, Vineland has been trialing slip production at their facility and were interested in comparing slip quality with more conventional slip production from the United States. In addition to their own breeding stock, Vineland produced slips of widely available varieties (Orleans and Covington) and they were compared with slips of the same varieties produced in the US. Additionally, Charles Keddy Farms was interested in trialing slip production in Nova Scotia for the promising variety V12B-445, and were also interested in comparing a new variety out of the US (Bellevue) with the Canadian breeding stock (Table 1).

Table 1. Varieties and slip origin in G3 trial.

Variety	Slips originating from Vineland	Slips originating from US	Slips originating from NS
V13E.097*	X		
V13D.114*	X		
V12B.456*	X		
V12B.445*	X		X
Orleans	X	X	
Covington	X	X	
Bellevue		X	

*Slips with an * are from the Vineland Research Institute breeding program*

Two trials were established as an incomplete factorial design, variety as one treatment (n = 7 treatments) and slip origin (Ontario, or "away", n=2) as a second treatment, each with four replications, on either black plastic or bare ground (not on black plastic). Each plot on plastic consisted of 30 plants and was 4.5m long. On 31-May-2016, 12m sections of plastic mulch were cut away to expose the bare ground for a replication of the first trial on bare ground (no black plastic) raised beds. Each plot on bare ground consisted of 20 plants and was 3m long. All slips were planted on 1-June-2016.

Tubers were harvested from the trial on black plastic on 21-September-2016 as outlined in Section 3.1.

Tubers were harvested from both the trial on black plastic and the trial on bare ground on 13-October-2016 following the same procedure as above. Data on brix content was collected on three tubers from each black plastic plot after a period of curing of approximately 4 weeks.

3.3. Evaluating the effect of season extension techniques on two varieties of sweet potatoes in Nova Scotia.

Sweet potato sales spike at Thanksgiving, however, due to the shorter growing season in Nova Scotia, sweet potato harvest does not usually occur until mid-October, missing this market opportunity. Due to

other labour constraints on Charles Keddy Farms, and to allow for enough time for the sweet potatoes to cure, harvest for the Thanksgiving market would need to occur by mid-September. Season extension techniques were trialed on V12-445 (slips produced by Charles Keddy Farms), and Orleans (slips produced by Vineland Research Institute) in an effort to allow the crop enough time to bulk prior to an early harvest in mid-September.

The trial was set up as a 2x2x3 factorial, variety x soil cover (bare ground or black plastic, n =2) x row cover (Agribon row cover, AG-19, or no row cover, n = 2) x planting date (n = 3, 12-May-2016, 18-May-2016, and 1-June-2016), with four replicates. The June planting date reflected the typical planting date of sweet potatoes in Nova Scotia.

Beds were shaped prior to the earliest planting date, on 10-May-2016, and black plastic mulch was laid on 11-May-2016. In plots that were designated for bare ground treatments, plastic was cut away and the loose ends buried to maintain integrity immediately before planting.

All row covers were removed on 4-July-2016. Bed dimensions were the same as in Section 3.1. V12B-445 plots contained 30 plants at 30 cm spacing and were 5m long. Orleans plots contained 15 plants and were 2.5m long due to a shortage of slips.

Data was collected as described in Section 3.1. Four plants from each plot were harvested at each of the two harvest dates. The harvest dates were 15-September-2016, and 14-October-2016.

3.4. Evaluating the effect of slip plant spacing on sweet potato yield characteristics.

To evaluate the effect of plant spacing on yield characteristics of sweet potatoes, a 4 x 2 factorial was established with four replicates, where spacing was one treatment (25cm, 30cm, 35cm, and 40cm between plants within each row, n = 4) and the second treatment was soil cover (n = 2, black plastic or bare ground).. V12-445 plants were produced by Charles Keddy Farms were used. Each plot contained 30 plants, and varied in length due to the variable plant spacing. Plot lengths were 3.75m (25cm spacing, 24,195 plants/acre), 4.5m (30cm spacing, 20,142 plants/acre), 5.25m (35cm spacing, 17,252 plants/acre), and 6m (40cm spacing, 15,107 plants per acre). Prior to planting, the areas for the bare ground plots were identified and the plastic mulch was cut away to expose the ground beneath. Slips were planted on 2-June-2016.

Data was collected as described in section 3.1. Replicates 2, 3, and 4 were harvested on 11-October-2016. Replicate 1 was harvested on 12-October-2016.

4. Results

4.1. G2 Variety Trial

There were significant differences between varieties for yield of US #1's (p=0.0200), which is the target market size of sweet potatoes. Orleans had the highest yield of US #1's (45,500 lbs/acre). Varieties D160, D178, D179, D180, D195, and G209 yield statistically the same as Orleans (Figure 1).

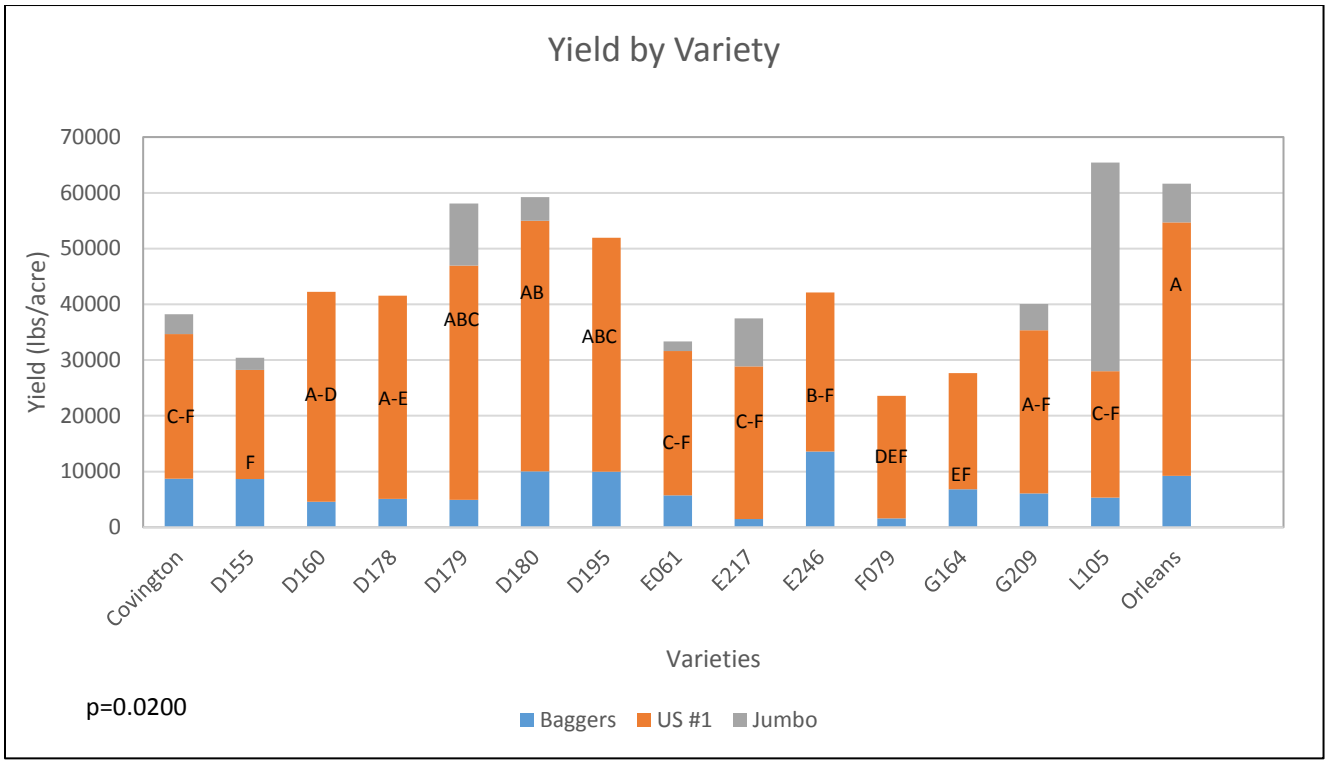

Figure 1. Sweet potato variety trial (G2) yields in Nova Scotia, columns followed by the same letter do not have statistically different yields of US #1s.

Significant differences were found between varieties (p = 0.0400) in slip survival, with E246, Orleans, and G164 having significantly lower survival than the top performing varieties (D155, D195, F079) (Table 2).

Table 2. Percent survival (p=0.0400) and Brix (p=0.0002) for G2 variety trial grown on black plastic in Nova Scotia, October 12, 2016.

Variety	Survival (%)		Brix (°B)	
G209	93.9	AB	5.6	CDE
D155	92.5	A	7.8	BC
D195	92.5	A	6.2	CDE
F079	92.5	A	5.6	DE
D179	91.3	AB	5.6	DE
E217	91.3	AB	8.6	AB
D160	88.8	AB	6.2	CDE
D178	87.5	AB	6.6	CDE
D180	86.3	ABC	5.8	DE
L105	82.9	ABC	7.4	BCDE
Covington	80	ABC	5.9	DE
E061	80	ABC	7.4	BCD
G164	78.8	BC	10.5	A
Orleans	78.8	BC	5.3	E
E246	73.8	C	6.6	BCDE

Significant differences were found between varieties (p = 0.0002) in Brix level, with Covington having statistically lower Brix level than D155, E217, and G164 (Table 1). G164 had a statistically higher Brix level than all other varieties with the exception of E217.

Clockwise from top left: D178, D160, E246, G209, L105, D179, E217, F079

Clockwise from top left: D155, Orleans, Covington, D195, Orleans, E061, D180, G164

4.2. G3 and Slip Origin Trial

4.2.1. G3 Trial: Harvest date

While there was no significant interaction between harvest date and variety for US #1 grade sweet potatoes ($p = 0.7050$), there were significant effects within each harvest date (Figure 1). Bellevue, a new

variety to Nova Scotia from the US, had the highest yield of US #1s at both harvest dates (52,900 lbs/acre of US #1s at the September harvest date and 54,500 lbs/acre of US #1s at the October harvest date).

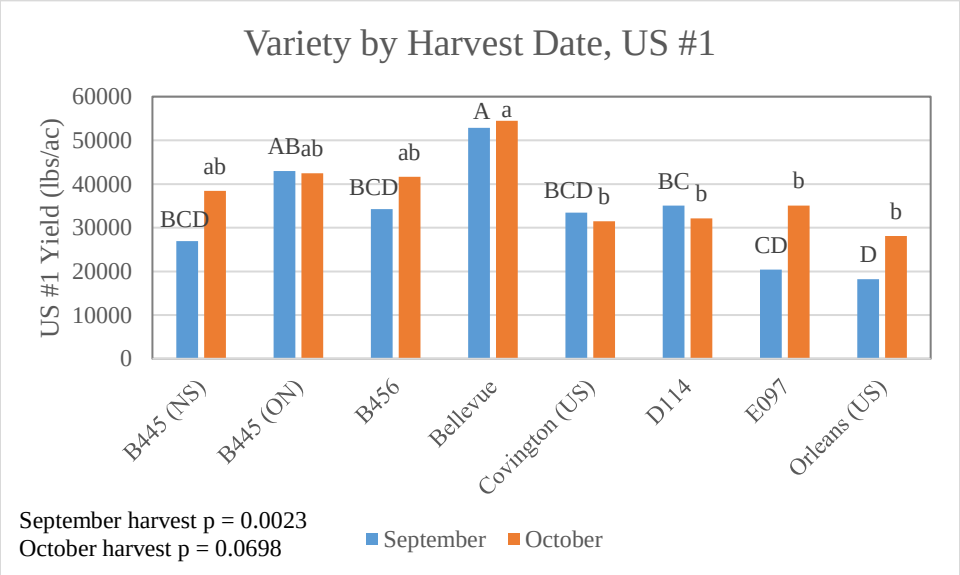

*Figure 1. Sweet potato variety trial (G3) yields of grade US #1s at two different harvest dates in Nova Scotia, 2016. Columns followed by the same **capital** letter (September harvest) are not significantly different. Columns followed by the same **lower case** letter (October harvest) are not significantly different.*

For total yield, there were significant differences between harvest timing where the October harvest yielded significantly more total yield (baggers, US #1, and Jumbo combined) than the September harvest (Table 3).

Table 3. Sweet potato variety trial (G3) differences between yields at both harvest dates across all varieties.

Harvest	Baggers (lbs/ac)	US #1 (lbs/ac)	Jumbo (lbs/ac)	Total yield (lbs/ac)
September harvest	8790.6	33017 B	3075.56	45843 B
October harvest	9375.16	37974 A	5010.58	51699 A
p-value	0.6602	0.0971	0.245	0.0356

There was no significant interaction between variety and harvest date, but there were significant differences between varieties. This means that varieties that performed well in September, also performed well in October. Bellevue having the highest total yield at both harvest dates (62,600 lbs/acre in September and 63,800 total lbs/acre in October), statistically similar to V12B.445 from Ontario (which had a total of 51,300 lbs/acre in September and 60,000 lbs/acre in October) (Figure 2).

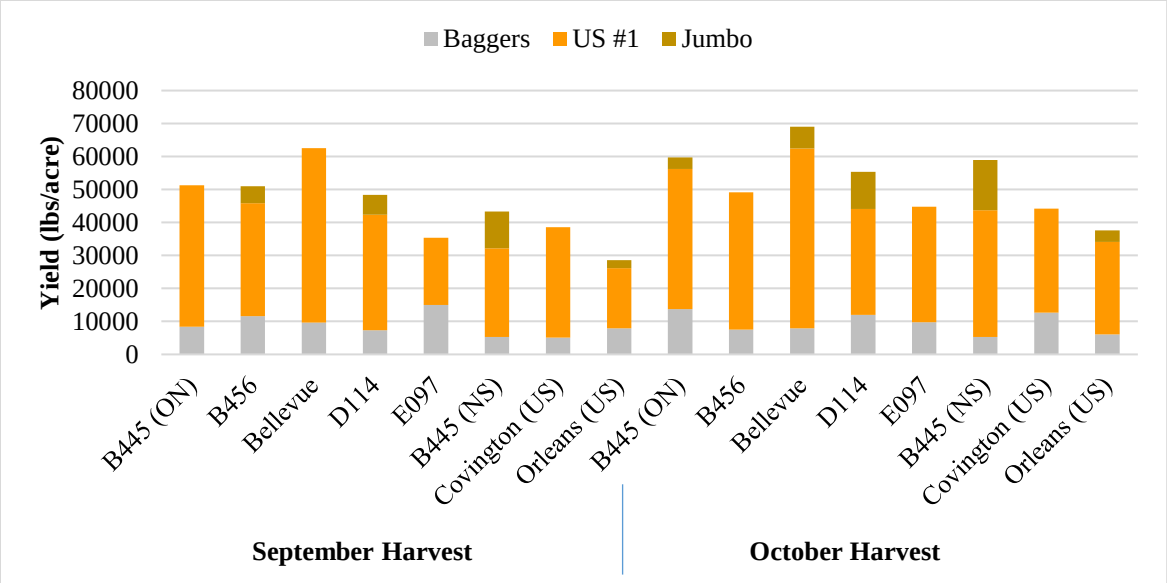

Figure 2. Sweet potato variety trial (G3) total sweet potato yields at two different harvest dates in Nova Scotia, 2016.

Significant differences were found between varieties (p = 0.0004) in Brix level measured on the October harvest date, with Bellevue, Covington from Ontario, and V13D.114 having lower brix levels than the other varieties (Table 4).

Table 4. Brix levels for G3 variety trial grown on black plastic in Nova Scotia, 2016, p = 0.0004.

Variety	Brix	
B445 (NS)	7.3	A
Orleans (ON)	7.3	A
B456	6.8	A
B445 (ON)	6.7	A
Covington (US)	6.7	A
E097	6.6	A
Orleans (US)	6.6	A
Bellevue	5.3	B
Covington (ON)	5.3	B
D114	5.0	B

4.2.2. G3 and Slip Origin Trial: Plastic vs. Bare Soil

Surprisingly, for most of the Vineland varieties, being grown on plastic vs. grown on bare ground did not have a significant impact on plant survival (V12B.445, V12B.456, V13D.114) however, the varieties commonly grown in Canada from the US (Covington and Orleans) had significantly lower survivability when grown on bare ground compared to when they were grown on plastic (Table 5).

Table 5. G3 variety trial plant survival in Nova Scotia, 2016, p = 0.0244.

Variety	Soil cover	Survival	
B445 (NS)	Bare	91%	AB
B445 (NS)	Plastic	86%	ABCD
B445 (ON)	Bare	76%	BCDEF
B445 (ON)	Plastic	88%	ABC
B456	Bare	76%	BCDEF
B456	Plastic	86%	ABCD
Bellevue	Bare	75%	CDEF
Bellevue	Plastic	88%	ABC
Covington (ON)	Bare	69%	EF
Covington (ON)	Plastic	91%	AB
Covington (US)	Bare	73%	DEF
Covington (US)	Plastic	89%	ABC
D114	Bare	91%	AB
D114	Plastic	81%	ABCDE
E097	Bare	63%	F
E097	Plastic	92%	A
Orleans (ON)	Bare	73%	DEF
Orleans (ON)	Plastic	91%	AB
Orleans (US)	Bare	81%	ABCDE
Orleans (US)	Plastic	90%	ABC

Varieties that were grown on bare soil had significantly lower yields of US #1 grade sweet potatoes ($p < 0.0001$). It was interesting to note that the more commonly grown varieties Covington and Orleans, regardless of slip origin, had significantly lower yields on bare ground that were approximately 50% of the yields grown on plastic. The new varieties out of the Vineland breeding program did much better, and there were no significant differences in US #1 yields between the Vineland varieties grown on plastic or grown on bare ground. The variety V13.097 only lost an average of 1% in yield when grown on bare ground, and V12B-445 with slips from Nova Scotia actually produced slightly higher yields on bare ground than on plastic (although there was not a statistically significant difference) (Figure 3).

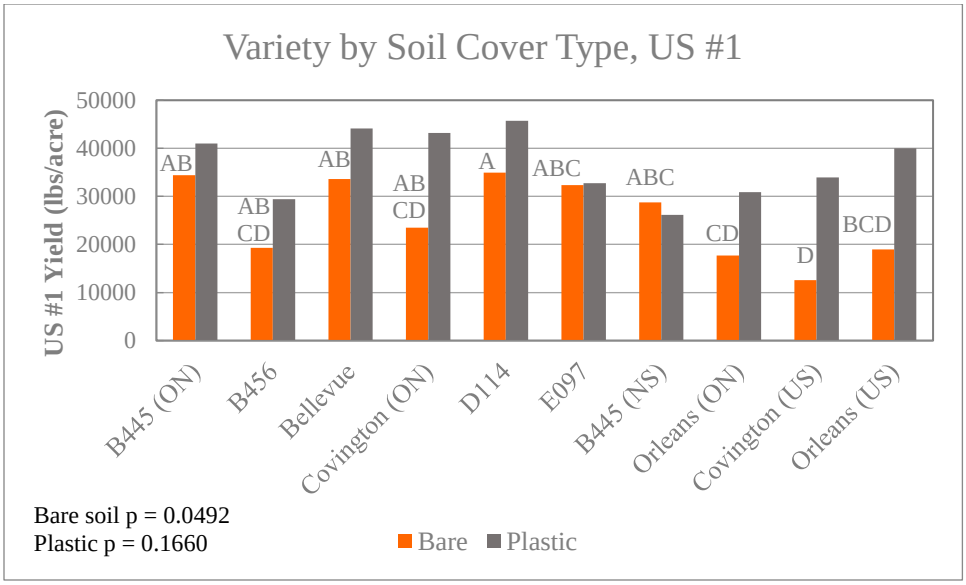

Figure 3. Sweet potato variety trial (G3) US #1 yields grown either on black plastic or on shaped beds with no soil cover in Nova Scotia, 2016. Columns followed by the same capital letter (bare soil) are not significantly different.

Variety V13E.097 grown on bare ground had an equal total yield to the top performing varieties grown on plastic (Figure 4). Due the unseasonably warm temperatures in 2016, several of the varieties grown on bare ground yielded quite well, with V12B.445 (ON slips), Bellevue, V13D.114, and V13E.097 all yielding over 30,000 lbs/acre of US #1 grade sweet potatoes.

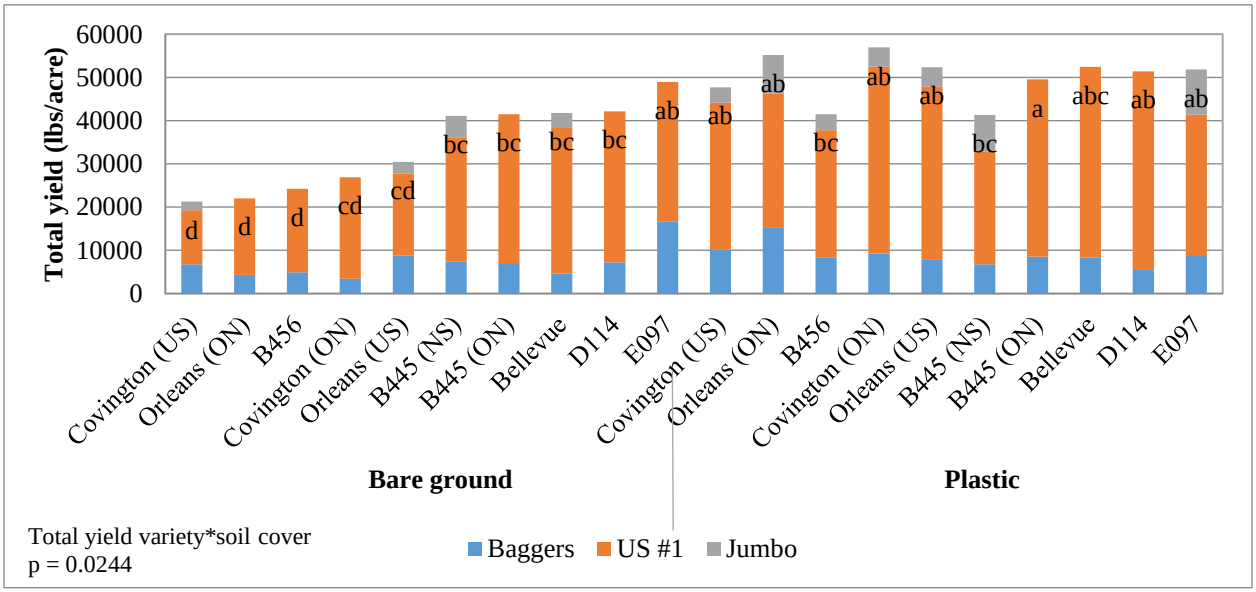

Figure 4. Sweet potato variety trial (G3) total sweet potato yield grown on either black plastic or on shaped beds with no soil cover in Nova Scotia, 2016. Columns followed by the same letter are not significantly different.

4.2.3. G3 and Slip Origin Trial: Slip Origin

Slip origin did not appear to have any significant effects on US #1 yield, total yield, percent survival, or Brix content (Table 6).

Table 6. Effects of slip origin on sweet potato yield, quality, and survivability, Nova Scotia 2016.

Variety	Origin	Baggers		US #1		Jumbo		Total yield		Percent survival	Brix	
		----------(lbs/acre)----------								%		
445		9542	AB	40436	A	9365	A	59343	A	90.3	7.0	A
Covington		10900	A	32710	AB	0	B	43610	B	88.5	5.7	B
Orleans		5482	B	28790	B	8023	AB	42295	B	84.5	6.9	A
	p-value	**0.0430**		**0.1014**		**0.0576**		**0.0058**		**0.3685**	**0.0035**	
	Away	8012		32666		6216		46893		88.3	6.6	
	ON	9271		35291		5376		49939		87.2	6.5	
	p-value	**0.4624**		**0.5434**		**0.7955**		**0.4730**		**0.7288**	**0.5668**	
445	NS	5330	B	38413		15209	A	58951		90.8	7.3	A
445	ON	13754	A	42460		3522	BC	59735		89.8	6.7	AB
Covington	US	12649	A	31504		0	C	44154		91.8	6.0	BC
Covington	ON	9152	AB	33915		0	C	43067		85.3	5.4	C
Orleans	US	6057	B	28080		3438	BC	37575		82.5	6.6	AB
Orleans	ON	4908	B	29499		12608	AB	47015		86.5	7.3	A
	p-value	**0.0224**		**0.9679**		**0.0492**		**0.5549**		**0.4488**	**0.1150**	

Left: V12B.445 (NS)
Right: Orleans (US)

Left: Covington (US)
Right: V13D.114

Left: V12.B445 (ON)
Right: V13E.097

Left: Bellevue

4.3. Season Extension Trial

Overall, it was a very warm spring in 2016. Typical last frost in Kentville, NS is May 16th, however, the last recorded frost this year was May 1, 2016. Average temperatures even after the first planting date of May 12, 2016 tended to stay up at 10°C or greater, with the exception of May 16 where the average temperature was 3.6°C. This chilly day on May 16th probably impacted survival of the first planting date on May 12. After the second planting date on May 18, ~7 mm of rain was received four days later on May 22, and again ~6mm on May 30 which likely improved the survival of that planting date. After the June 1 planting date, no significant rainfall was recorded, however the drip irrigation was run regularly which would account for the good yields realized in 2016.

4.3.1. Slip Survival, Brix

Unsurprisingly, the earliest planting date (May 12) resulted in lower plant populations, compared to the latter planting dates (May 18, June 1) for variety B445 (Figure 5). Slips planted on May 12 that had neither row cover nor black plastic had a 60% reduction in plant population, with only 40% of plants surviving to harvest. It is likely that this is due to a rather cold day four days after planting (May 16, average temperature 5.9°C with a low of 3.6°C as recorded in Kentville, NS). Survivability of that earliest planting date was improved to ~60% when either row cover and/or black plastic was used, which would have offered a modicum of protection from the cold weather. The benefits of black plastic for the May 18 planting date resulted in statistically similar survivability as the June 1 planting date.

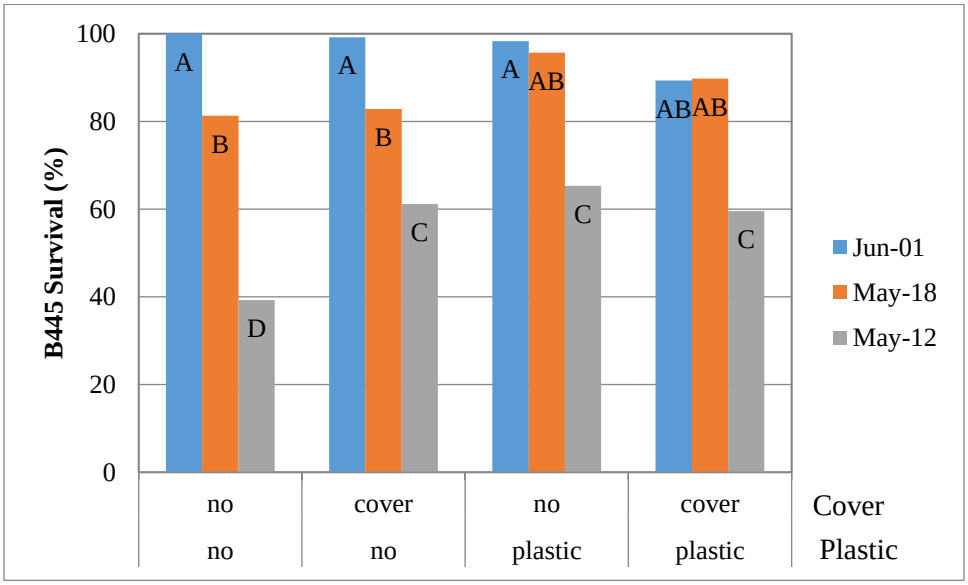

Figure 5. Survival of variety B445 based on season extension techniques ($p<0.0001$), Nova Scotia 2016.

Trends in plant survival were a little harder to tease out for the variety Orleans (Figure 6). Slips that were planted on May 12 had the worst survival if they had either no season extension techniques (bare ground, no cover), or had double season extension techniques (cover, black plastic), ~60% survival. As mentioned previously, it is likely that this is due to a rather cold day four days after planting (May 16, average temperature 5.9°C with a low of 3.6°C as recorded in Kentville, NS).

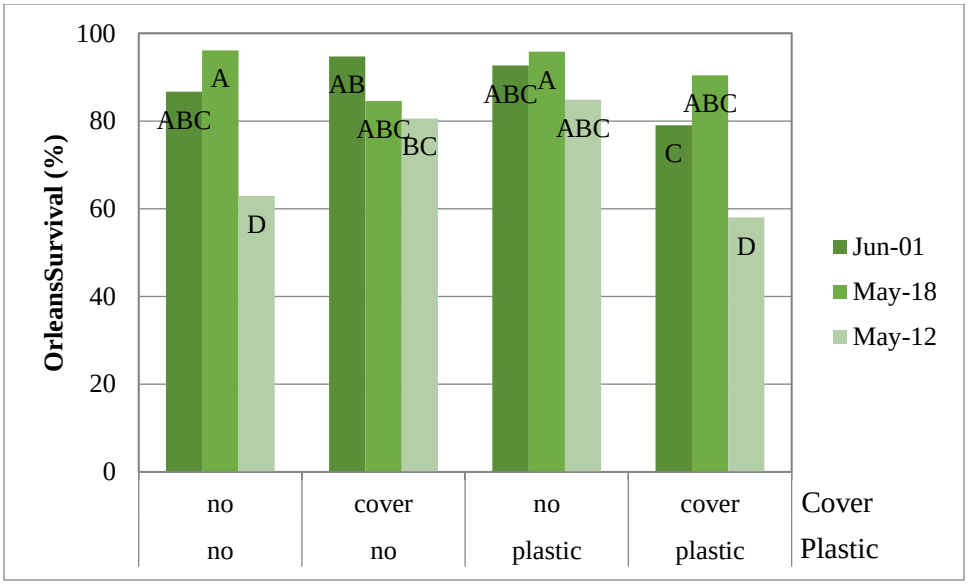

Figure 6. Survival of variety Orleans based on season extension techniques (p<0.0001), Nova Scotia, 2016.

The interaction between planting date and row cover had an effect on brix as measured on the October harvest date (Table 7). At the latter two planting dates (May 18 and June 1), row cover significantly increased the brix content of the sweet potatoes. There was no significant interaction detected between variety*cover*plastic*planting date.

Table 7. Brix measured on October harvested sweet potatoes in the Season Extension trial, Nova Scotia 2016.

Planting date	Cover	Brix	
June 1	no	8.3	B
June 1	cover	9.5	A
May 18	no	8.3	B
May 18	cover	8.9	AB
May 12	no	8.5	B
May 12	cover	8.4	B
	p-value	**0.0702**	

4.3.2. Season Extension trial: September harvest

Significant differences were found between season extension techniques and planting date in the yield of US #1 in the September harvest of variety B445 (Figure 7) and Orleans (Figure 8). For variety B445, the latter two planting dates (May 18 and June 1) resulted in statistically similar yields, regardless of season extension technique (row cover, black plastic, and combinations thereof). For the first planting date (May 12), simply having black plastic was enough to have statistically similar US #1 yields as the latter two planting dates. The 2016 season was rather atypical in that it was a fairly warm spring; which would have affected the yields and survivability of the earlier planting dates. The average last frost date in Kentville, NS is May 16th, however this season the last recorded frost was on May 1, 2016.

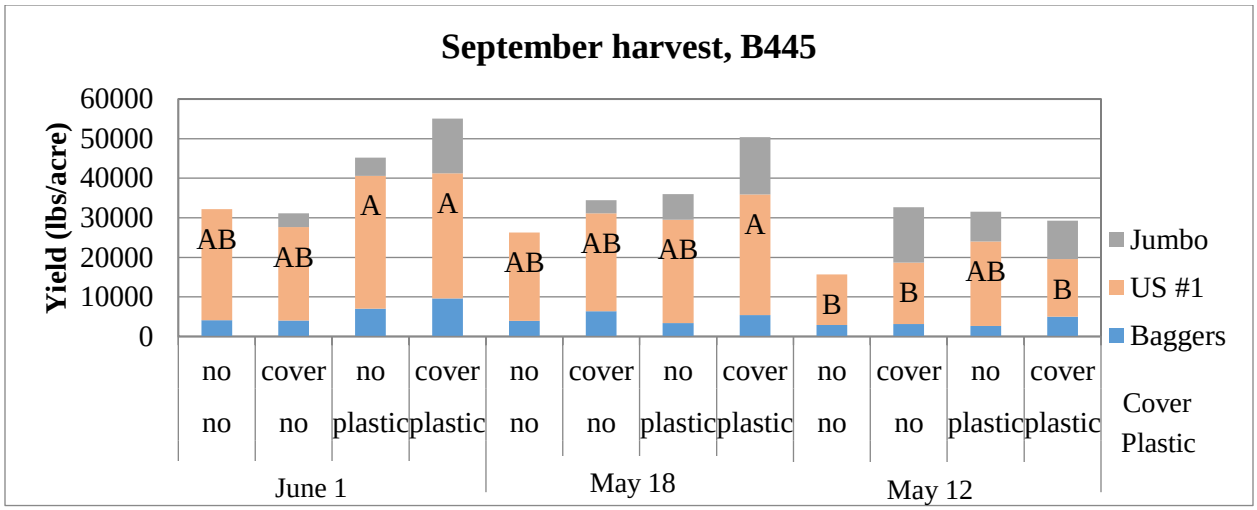

Figure 7. Season extension effects on variety B445 at the September harvest date. Letter groupings correspond to significant differences between treatments for US #1 yield (p = 0.1154), Nova Scotia, 2016.

Trends in season extension efforts were less clear with the variety Orleans. The use of black plastic was consistent with the higher yielding planting dates, regardless of row cover (Figure 8).

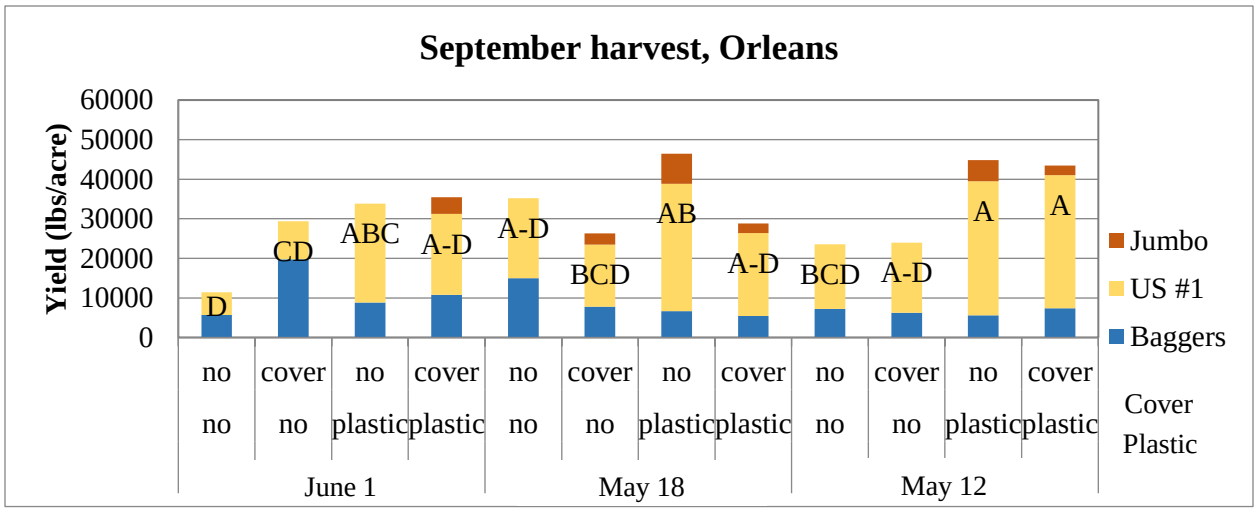

Figure 8. Season extension effects on variety Orleans at the September harvest date. Letter groupings correspond to significant differences between treatments for US #1 yield (p = 0.0072), Nova Scotia, 2016.

When comparing yields of US #1 in the first planting date (May 12), in general B445 had lower yields of US#1 compared to Orleans, and black plastic seemed to be the key to higher yields (Figure 9). Orleans planted on May 12 into black plastic resulted in yields of US #1 well over 30,000 lbs/acre.

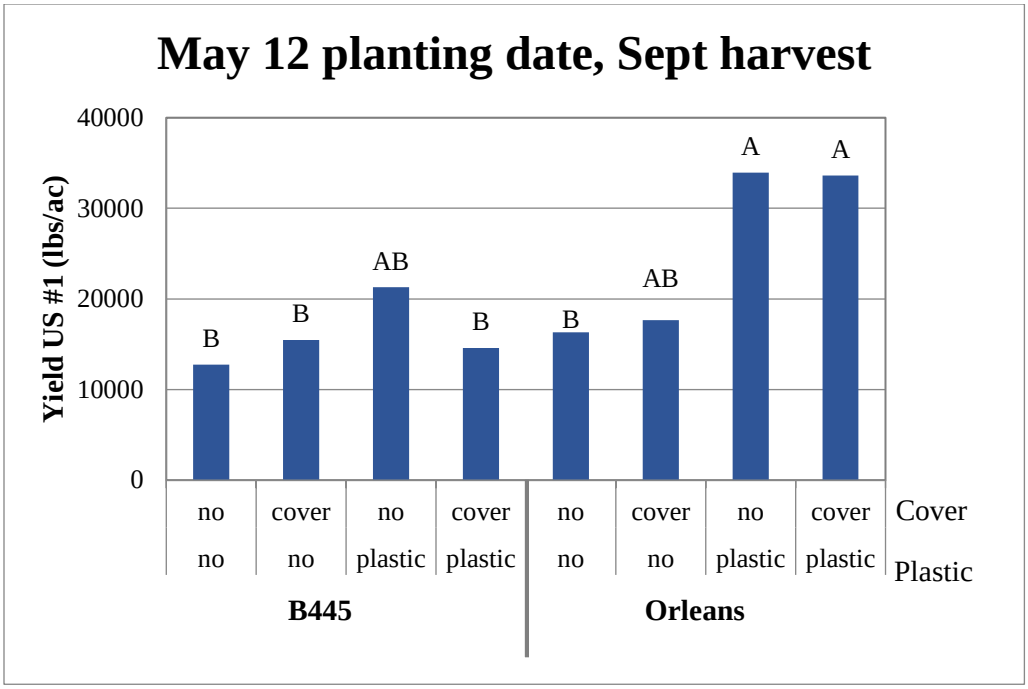

Figure 9. US #1 yields (p=0.0282) for the earliest planting date in the Season Extension trial at the September harvest, Nova Scotia 2016.

There were no significant differences between yields for the May 18 planting date, regardless of variety and season extension technique. Using black plastic tended to produce higher yields.

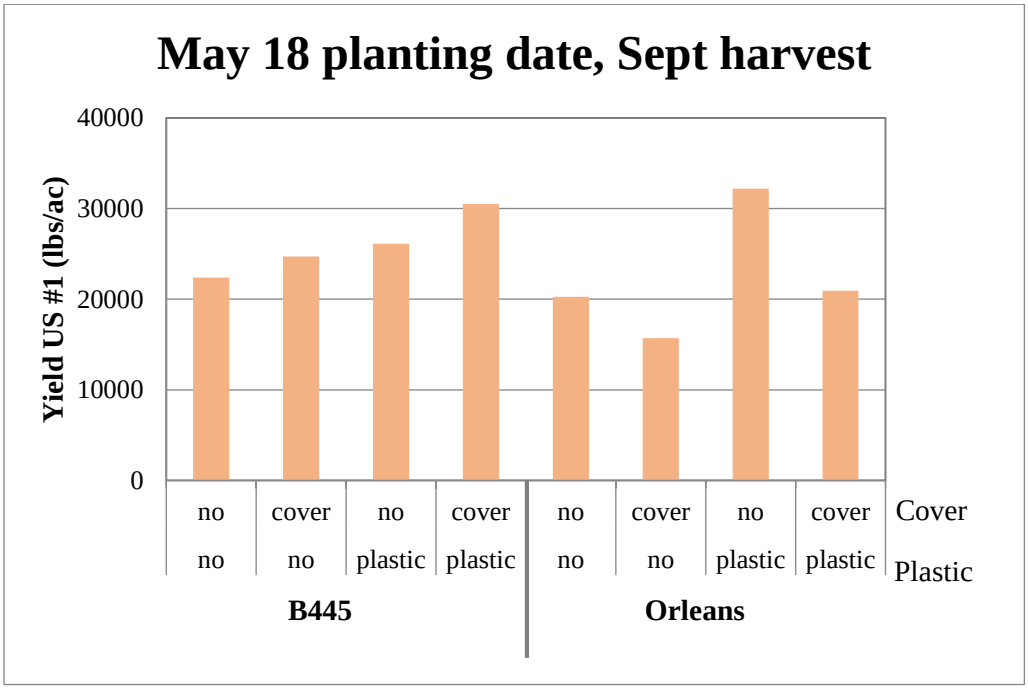

Figure 10. There were no significant differences in US #1 yields for the May 18 planting date in the Season Extension trial at the September harvest, Nova Scotia 2016.

For the June 1 planting date, typical of planting dates in Nova Scotia, B445 generally had higher yields of US#1 than Orleans, and when B445 was grown on black plastic, it resulted in over 30,00 lbs/acre of US #1. If Orleans was grown on black plastic, it had statistically comparable yields to B445.

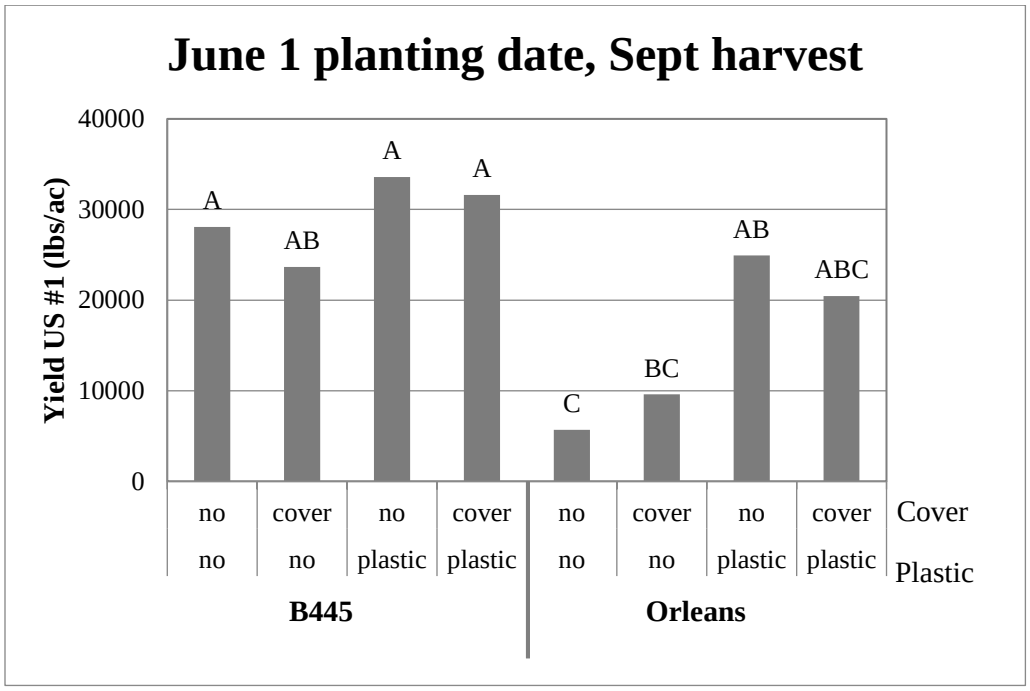

Figure 11. US #1 yields (p=0.0039) for the June 1 planting date in the Season Extension trial at the September harvest, Nova Scotia 2016.

4.3.3. Season Extension trial: October harvest

Significant differences were found between season extension techniques and planting date in the yield of US #1 in the October harvest of variety B445 (Figure 12) and Orleans (Figure 13). On the latter two planting dates (May 18 and June 1), black plastic resulted in the highest yields, regardless of row cover. Slips that were planted on May 12 on black plastic yielded high levels of Jumbos by the time the October harvest rolled around, going from 7,600 lbs Jumbos/acre (plastic, no cover) and 9,700 lbs Jumbos/acre (plastic, with cover) at the September harvest date to 22,800 lbs Jumbos/acre (plastic, no cover) and 57,100 lbs Jumbos/acre (plastic, with cover) by October.

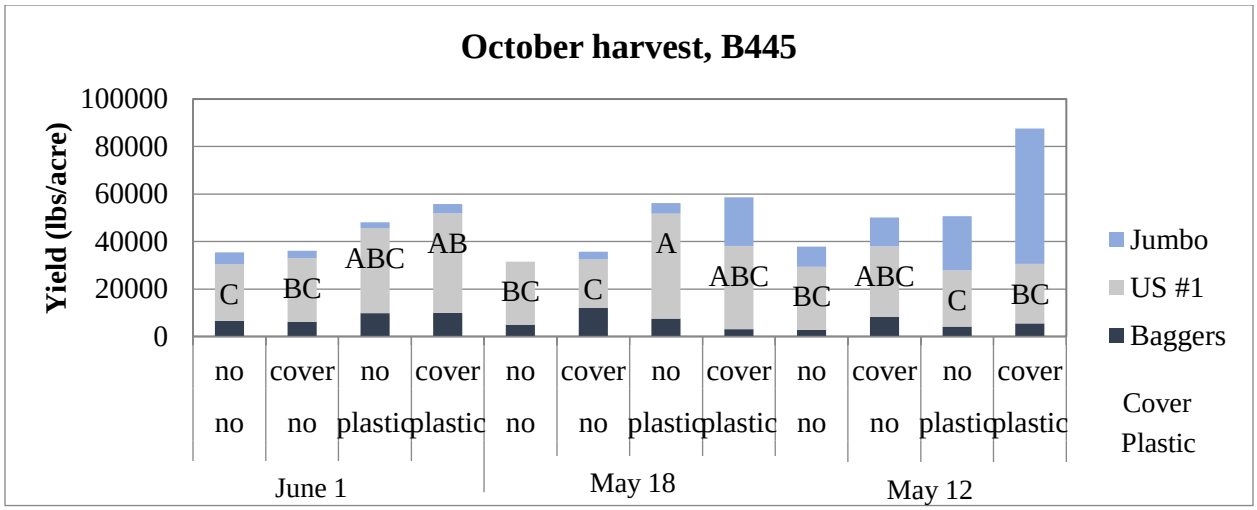

Figure 12. Season extension effects on variety B445 at the October harvest date. Letter groupings correspond to significant differences between treatments for US #1 yield (p = 0.1017), Nova Scotia, 2016.

Similar to trends observed in B445, with slips planted on black plastic with row cover on May 12 had very high yields of Jumbo (39,500 lbs Jumbo/acre), as did slips planted on May 18 with cover and black plastic (23,900 lbs/acre) (Figure 13).

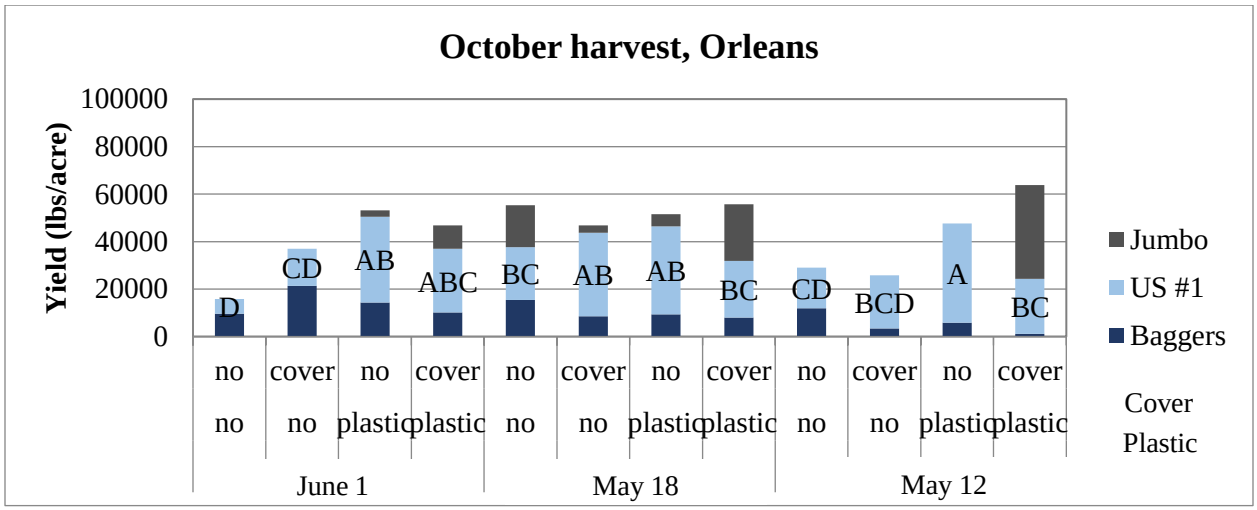

Figure 13. Season extension effects on variety Orleans at the October harvest date. Letter groupings correspond to significant differences between treatments for US #1 yield (p = 0.0012), Nova Scotia, 2016.

There were marginal differences between season extension techniques for the first planting date of May 12 by the time of October harvest (p=0.1337, Figure 14). Orleans grown on plastic with no cover had the highest yields with over 40,000 lbs/acre of US #1 sweet potatoes, but not significantly different from B445 grown under cover (with plastic and not with plastic), or grown on bare ground with no cover.

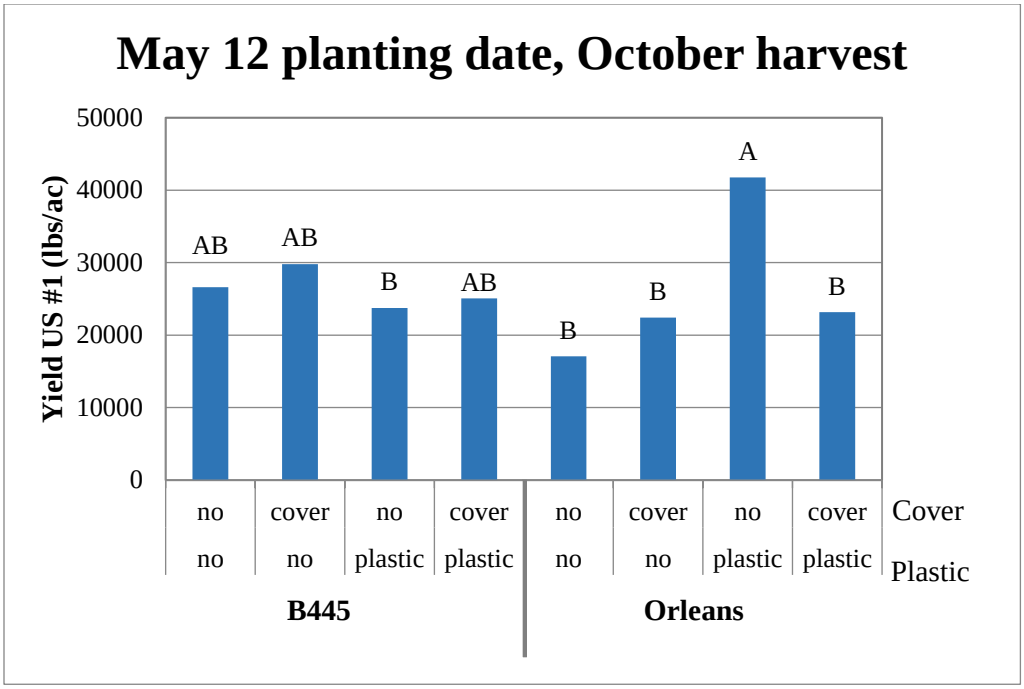

Figure 14. US #1 yields (p=0.1337) for the earliest planting date in the Season Extension trial at the October harvest, Nova Scotia 2016.

At the second planting date on May 18, when either B445 or Orleans were grown on plastic with cover, it resulted in a lower yield hit of US #1 compared to when they were grown without cover (Figure 15), due to more sweet potatoes reaching the Jumbo grade due to the added heat units (Figure 12).

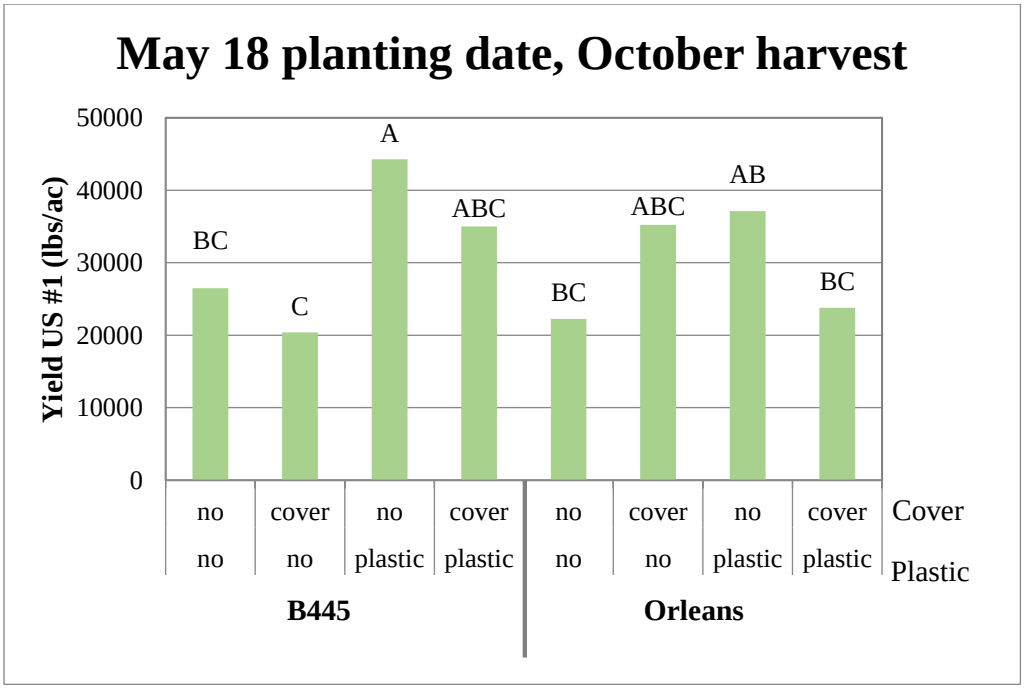

Figure 15. US #1 yields (p=0.0589) for the May 18 planting date in the Season Extension trial at the October harvest, Nova Scotia 2016.

The variety B445 planted on bare soil with no cover had lower yields compared to the use of season extension techniques on B445, however, they were not significantly different from when B445 was grown with cover, or with just plastic (Figure 16). B445 grown with cover and plastic had the highest yields of over 40,000 lbs/ac of US #1. Growing Orleans on plastic resulted in higher yields compared to growing them not on plastic.

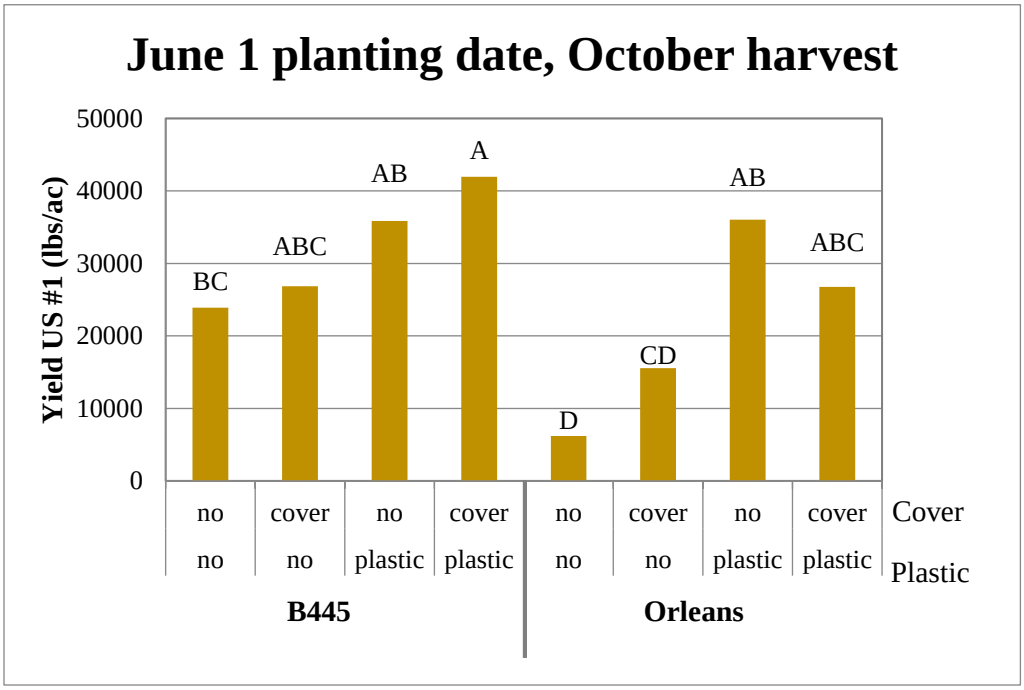

Figure 16. US #1 yields (p=0.0007) for the June 1 planting date in the Season Extension trial at the October harvest, Nova Scotia 2016.

4.4. Slip Spacing Trial

Growing B445 slips on plastic resulted in significantly greater yields, regardless of plant spacing. In between plant spacings there were no significant differences in yields, nor were there significant differences in the interactions between spacing and soil cover.

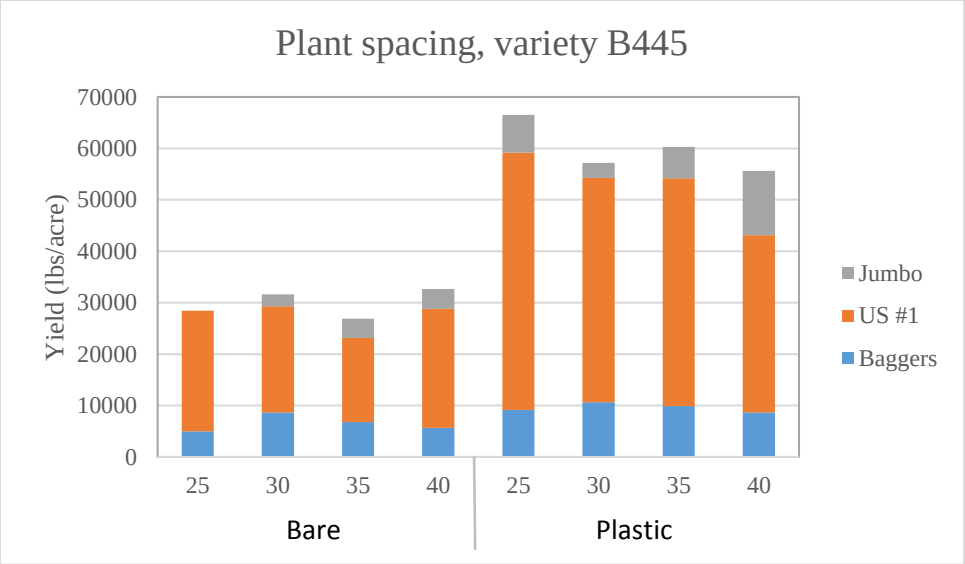

Figure 17. Yields for variety B445 at different slip spacings on black plastic and on bare ground, Nova Scotia 2016. There were no significant effects of slip spacings on yield parameters.

5. Timelines and Action Plans for 2017

Moving forward into the 2017 growing season, evaluations will continue on second and third generation sweet potato varieties (G2 and G3) in conjunction with Vineland Research Institute, Vineland, Ontario. Second generation varieties will be planted into beds covered with black plastic. Third generation varieties will be trialed on both plastic and bare ground beds. All variety trials will be planted at the target planting date for Nova Scotia, around the first of June. They will be harvested around mid-October. Due to no significance being detected between plant spacing for B445 in 2016, this trial will not be repeated.

Based on results from the season extension trial conducted in the 2016 growing season, a 2x2x2 factorial experiment will be set up to look at the effect of planting date (mid-May, beginning of June, n=2), variety (B445 and Bellevue, n=2), and use of row cover (cover, no cover, n=2) on sweet potato yield characteristics. All plots will be harvested around mid-September in order to be cured and ready for the Thanksgiving market.

A question that arose from the 2016 research was concerned how long the row cover was over the plants. In order to look into this further, a 2x3 factorial experiment will be set up to determine the effect of planting date (n=2, mid-May and beginning of June) and length of time under row cover on sweet potato yield characteristics. This trial will be conducted on the variety Bellevue. Plots will be uncovered during the week of June 12, June 19, and June 26 (n=3).

Additionally a field scale 2 x 2 trial will be undertaken where Bellevue will be planted in either mid-May or early June (planting date, n=2) under row cover, either with plastic or without plastic (ground cover, n=2).

5.1. Communication Plan

A final report that is generated from this work will be shared on the Perennia website, and a link will be distributed through Horticulture Nova Scotia and through the Nova Scotia Vegetable Blog. Additionally, a YouTube video will be made discussing the merits of local sweet potato production.

Horticulture Nova Scotia holds an annual convention, the Scotia Horticultural Congress. The Congress is a well-attended event, with growers from across the Maritimes participating. Rosalie Madden will present the findings from this work in January 2018.

6. Budget

Project Item	**Budgeted Year 1**	**Actual expenditure Year 1**	**Projected Year 2**
Contracted labour and consultant fees	$13,200	$14,144.58	$13,200
Supplies and services	$1,200	$317.42	$400
Travel	$600	$528	$600
Publication	$0	$0	$800
Total project costs	$15,000	$15,000	$15,000
NSDA (75% of total)	$11,250	$11,250	$11,250
Industry contribution (25% of total)	$3,750	$3,750	$3,750

Projected budget for 2017 remains as previously outlined in the original Farm Innovation Program application of $15,000 (above).