Potato Variety Development in Alberta
Project 2011F047R (2011-2013)

FINAL REPORT

Prepared for the
Alberta Crop Industry Development Fund
5030 – 50 Street
Agriculture Building
Lacombe, AB T4L 1W8

By

Michele Konschuh[1], Darcy Driedger[1], Benoit Bizimungu[2], Jeanne Debons[3] and Deb Hart[4]
[1] Alberta Agriculture and Rural Development, Crop Diversification Centre South, 301 Horticultural Station Road East, Brooks, AB T1R 1E6
[2] Agriculture and Agri-Food Canada, Potato Research Centre, 850 Lincoln Road, P.O. Box 20280, Fredericton, NB
[3] Potato Variety Management Institute,
[4] Potato Growers of Alberta, Crop Diversification Centre North, 17507 Fort Road NW, Edmonton, AB

November 17, 2014

Table of Contents

Executive Summary

This project was initially developed to pilot potato variety evaluation work as a cooperative effort between breeding programs, variety development companies, processors, packers and producers. The trials were conducted at two provincial research centres, the Crop Diversification Centre South (CDCS) and the Crop Diversification Centre North (CDCN) in 2011. Internal restructuring limited the involvement of CDCN in 2012 and 2013 to demonstration plots. Interested parties supplied seed of test material and efforts were made to ensure that we could gather some agronomic data in the trial. Although optimizing N fertility for so many varieties was not practical, growing on 2 levels of N gave an indication as to the potential N-response of some of these newer cultivars. There are economies of scale involved in the cooperative approach to variety trials, but compromises were made to accommodate the majority of participants.

Participants were asked for Letters of Support, and the extent of participation each year of the trial was flexible. In the first year of the trial, funding from 13 industry stakeholders plus the Potato Growers of Alberta (PGA) was leveraged. In 2012, we attracted one additional participant. Some changes within the potato industry in Alberta reduced participation in 2013 to 8 cooperators, plus the PGA, however, the level of funding from several participants increased. Over the three year project, industry support was very good.

Each year of the trial, there were potato cultivars intended for the French fry market. French fry varieties must yield well and have good fry characteristics. Specific gravity of the potatoes is an indirect measure of fry colour. In 2011, 11 French fry cultivars were compared to 1 check variety. In 2012, 10 French fry cultivars were evaluated relative to 2 check varieties. Only 1 French fry cultivar was evaluated in 2013. Two levels of N were provided to the French fry cultivars in each year of the trial as agronomic data is often limited for new varieties. McCain Foods, Lamb Weston, and Maple Leaf Potatoes all participated in 2011 and 2012. Maple Leaf Potatoes was acquired by Cavendish Farms in 2012, but Cavendish did not participate in 2013.

Chipping potatoes were included in each year of the trial as well. Old Dutch Foods, as well as seed growers and variety development firms provided chippers for evaluation. Chipping potatoes are graded by size rather than weight. As with French fry cultivars, good fry colour is essential and specific gravity is a good indirect measure of chip colour. In 2011 and 2013, 9 chipping cultivars were compared to 2 check varieties. In 2012, 8 chipping cultivars were evaluated relative to 3 check varieties. Typically, chipping potatoes required less N than French fry cultivars and a moderate or low rate of N was requested for specific entries.

Fresh market potatoes were included in the trial each year as well. Although the fresh market sector of Alberta's potato industry is the smallest segment, there is a lot of growth potential even if we simply replace imported potatoes with locally produced ones. To accommodate cooperator preferences, the fresh market potatoes were graded either by weight or size categories as requested in 2011. Thirteen cultivars were evaluated by size along with 3 check varieties and 9 cultivars were evaluated by weight along with 2 check varieties. In 2012 and 2013, all clients were satisfied with grading by size. Fifteen fresh market cultivars and 4 checks were evaluated in 2012 and 11 fresh market cultivars and 2 checks were included in 2013. Culinary data was provided as requested. For table potatoes, potatoes were evaluated as baked and boiled to determine the best fit for marketing purposes.

A special category of fresh market potatoes is the creamer potato market, made popular by the Alberta based Little Potato Company. Creamer potatoes are not smaller versions of other fresh market varieties; the varieties are selected for high tuber set and small tuber size intentionally to satisfy this market. These potatoes are prepared with the skin on and may be served with limited additional preparation. As such, skin set and tuber appearance are critical. Flavour is also very important for this class of potatoes. Nine creamer cultivars were included in the trail in 2012 at 2 levels of N, and 31 creamer cultivars were included in 2013. The Little Potato Company participated in the trail in 2012 and 2013. Creamer potato entries were provided by other participants as well.

To ensure year-round supply of raw product for processors and packers, potato varieties must be stored for up to 11 months per year. Although this trial did not include a storage evaluation component, potatoes were offered to participants after harvest and grading to allow independent storage evaluation in commercially relevant facilities.

Agriculture and Agri-Food Canada (AAFC) has been involved in potato breeding for over 40 years. The National Potato Variety program includes selections that might be suitable for the French fry, chipping, or table market, including the creamer category. Industry participants are encouraged to view selections after one or two years of regional testing and to "pick up" the varieties for further testing. Without regional testing in Alberta and knowledge of how the cultivars perform in our growing environment, industry stakeholders would be hard-pressed to make selections. AAFC supplied test material for replicated trials at CDCS and demonstration trials at CDCN in each year of the trial and included entries suitable for all industry sectors. In 2011, 10 chipping cultivars, 7 French fry cultivars and 28 fresh market cultivars were evaluated along with relevant check material from eastern and western sources at CDCS and CDCN. In 2012, 9 chipping cultivars, 10 French fry cultivars and 36 fresh market cultivars were evaluated along with relevant check material at CDCS and CDCN. In 2013, 7 chipping cultivars, 7 French fry cultivars, and 18 fresh market cultivars were evaluated at CDCS along with relevant check varieties. A demonstration at CDCN included 70 cultivars in 2013.

One of the most interesting things we noted about the three-year trial, is that there were examples of AAFC material included in 2011 that was picked up by industry in 2012 and 2013. Some of the industry entries in all three years of the trial originated from the federal program and within the space of three years, seed supplies are being established and commercial production is anticipated. These releases have been identified throughout the report with a maple leaf. This type of flow-through and the engagement of all links in the value chain is the kind of positive outcome we hoped to achieve.

The potato industry in Alberta now has a model for how cooperative variety testing can work for them. The equipment, knowledge, and facilities are specialized and it is unlikely that an applied research association could easily step into this role. With a suitable location, specialized facilities and equipment, such as those at provincial research stations (CDCS, CDCN, etc.), an experienced coordinator with a competent technical staff could conduct these evaluations with industry funding in the future.

The framework of this trial formed the basis for an application to the Growing Forward 2 Science Cluster for potato variety evaluation work. Alberta will receive funding for an additional 4 years from this source. Eight stakeholders plus the Potato Growers of Alberta provided letters of support for the new project.

Project Overview

Potato variety evaluation trials were conducted at the Crop Diversification Centre North (CDCN) in Edmonton and the Crop Diversification Centre South (CDCS) in Brooks to provide data from rain-fed and irrigated production systems respectively. Standard varieties were included to represent early French fry, full-season French fry, early chipper, full-season chipper, fresh market red, fresh market white and fresh market yellow classes. Sufficient potatoes were planted to provide replicated data from CDCS and to host a demonstration field day at both locations each year.

Material for these trials was provided by industry stakeholders either through the AAFC Accelerated Release Program or by sourcing varieties from European, U.S. or other breeding programs. All import requirements were the responsibility of the stakeholder requesting evaluation.

At CDCS, we set up a nitrogen response trial with standard and reduced levels of nitrogen fertility. Stakeholders indicated whether or not they required fertility information and provided sufficient seed and funds to include these evaluations. At CDCS, we also planned to evaluate the response of potato varieties to plant density changes, but few clients requested this information.

Variety trials were set up as randomized complete blocks. Guard rows were planted to minimize edge effects. Four replicate rows (6m) will be harvested and an additional row was planted to allow for in-season sampling and demonstration. The agronomic trials were set up as split plot designs with nitrogen level as the main plot and varieties as sub plots.

Data collected included emergence data, stand count, total yield, grade by size category relevant to end-use, specific gravity, internal defects, external deformities, and culinary evaluations. Samples were retained for bruise testing, storage assessments or acrylamide testing by the stakeholders. Local production data supports adoption of new potato varieties that will enhance the competitiveness of our potato industry.

The leveraged funding from industry also provided resources for the regional evaluation of AAFC material prior to release to industry. Without funding from this project, there may not have been any opportunity to observe the breeding program cultivars in Alberta over the past three years.

A field day was hosted each year at both locations to allow stakeholders to evaluate the response of cultivars to rain-fed and irrigated growing conditions. There is no substitution for first-hand observation of potato varieties in the field.

As part of the proposed trial, we will work with stakeholders to develop a variety development mechanism for Alberta that takes us beyond the current project approach. The project is, in essence, a transition strategy to move the industry from a federal breeding program approach to a broader, more inclusive evaluation system.

Objectives:

A. To evaluate potential new varieties for processing (fry and chip), creamer and other markets;
B. To provide the potato industry an opportunity to assess varieties grown under local conditions;
C. To compare varieties from European, Tri-State and National breeding programs (AAFC) under Alberta conditions; and
D. To develop agronomic information on nitrogen response to support potato growers interested in producing new varieties.
E. To evaluate the cooperative approach to variety development and develop a model that takes the industry beyond the current project.

Project Team Members

Alberta Agriculture and Rural Development, Crop Diversification Centre South, Brooks, AB

- Dr. Michele Konschuh, Potato Research Scientist – Project Lead
- Dr. Darcy Driedger, Food Scientist
- Simone Dalpé, Potato Technologist (2011 only)
- Tina Lewis, Seed Potato Technologist
- Seasonal Technologists

Agriculture and Agri-Food Canada, Potato Research Centre, Fredericton, NB

- Dr. Benoit Bizimungu, Plant Breeder
- Technologists

Potato Variety Management Institute, Bend, OR

- Dr. Jeanne Debons, Executive director

Potato Growers of Alberta, Crop Diversification Centre North, Edmonton, AB

- Deb Hart, Seed Coordinator

Background

One of the key areas of research that the Alberta potato industry identified in industry-wide priority setting meetings in 2003 and 2004 is breeding for new potato varieties. This was reiterated in National industry consultation meetings held in 2011. For about 40 years now, Agriculture and Agri-Food Canada managed a potato breeding program in Western Canada focused on breeding and selecting varieties that would perform well under our environmental conditions. Alberta Agriculture facilitated the process by conducting regional trials, disease resistance trials, agronomic trials, culinary and storage trials with promising new varieties. In recent years, reductions in government staff and budgets put pressure on the support provided by both levels of government. The nature of potato breeding and selection has shifted. Industry participants are exploring varieties for different end-uses, such as gourmet and functional food uses. The potato breeding programs in Canada were consolidated into a National program in 2004 and there is now one National Potato Breeder based in New Brunswick. By necessity, less emphasis is directed at varieties best suited for Western Canada. Varieties from breeding programs in Europe and the United States are often being assessed by industry stakeholders.

Regional trials of potato varieties in Western Canada were funded in part by industry money collected through the Western Canadian Potato Breeding Consortium. This system was unique to Western Canada and served established industry stakeholders well. Newcomers to the industry were not easily able to participate. Even established stakeholders questioned whether they received sufficient value for the fees. The shift to an accelerated release mechanism moved the responsibility for the evaluations to industry and provides broader access to stakeholders initially. However, the window for evaluation of varieties is much narrower than in the Consortium and less data is available for decision makers.

Over the last 10 years, Alberta Agriculture and Rural Development staff worked with individual stakeholders in the potato industry to provide agronomic evaluations of potato varieties from various breeding programs. Public varieties are still widely grown, but not always as good a fit as private varieties for the same end use. Growing environments vary significantly among potato production regions in Canada. Alberta data is essential when selecting varieties appropriate for our climate, our customers and industry stakeholders.

Many breeding programs target disease resistance, nitrogen use efficiency and excellent storage potential in addition to increased yield. The challenge is often that impartial comparisons of the material with standards varieties are not available. Each stakeholder would have the responsibility to obtain seed, sign agreements, engage researchers, or evaluate varieties independently. Many are not equipped to conduct small-scale evaluations well and seed is not available for larger-scale evaluations. Breeder's seed also has higher tolerances for virus loads and producers evaluating this material on farm put the remainder of the crop at risk.

This project did not replace the Western Potato Consortium as it focused on Alberta. In addition, we evaluated any material, regardless of the breeding origin, that might be well suited to our climate and end-uses. Support was requested from many stakeholders, and there was some flux in support between members depending on the year of the study.

In Alberta, potato industry stakeholders are looking for replacement varieties that use less nitrogen, less water, less pesticide, yet yield superior processing or culinary quality and tonnage. Varieties from

breeding programs in Canada, Europe and the United States are often being assessed. Many breeding programs target disease resistance, nitrogen use efficiency and excellent storage potential in addition to increased yield. Tuber yield potential and nutritional requirements are impacted by variety characteristics and by environmental characteristics such as the length of the growing season (Westerman, 1993). As noted by Love et al. (2003), the full potential of a new variety may not be realized until proper management is implemented. There is increasing pressure on potato producers to utilize best management practices to reduce the environmental footprint for potatoes. The costs of such shifts in production practices will be borne primarily by producers.

An ideal French fry variety would have earlier maturity than Russet Burbank, be relatively tolerant of environmental fluctuations, have few defects, yield well and have specific gravity in the desired range (1.086 to 1.092). Good fry color out of the field is an asset, and good fry color out of storage is also very desirable. An ideal chipping variety would produce a good yield of medium sized tubers, be relatively tolerant of environmental fluctuations, have few defects, and have high specific gravity in the desired range (above 1.086). Chipping tubers with a good skin set, good maturity at harvest and low concentration of reducing sugars is also very desirable. Varieties that store well at cooler temperatures are an asset. Ideal fresh market varieties would produce a good yield of creamer or medium sized tubers, be relatively tolerant of environmental fluctuations, have few defects, and have an attractive appearance. Fresh market tubers with a good skin set that store well are very desirable.

The purpose of this project was to pool resources to evaluate potential varieties from a range of sources, using a cooperative approach. This trial was established to collect local agronomic data on varieties from breeding programs in Canada, the U.S. and elsewhere. Including agronomy in the evaluations allowed us to provide growers with additional relevant information when they consider producing new varieties. Often, there are economies of scale realized when varieties are evaluated collectively rather than individually. ARD was well positioned to provide regional data in an impartial setting. The varieties were planted in replicated plots at the Crop Diversification Centre South (CDCS) in Brooks, AB in 2011, 2012 and 2013 and in demonstration plots at the Crop Diversification Centre North (CDCN) in Edmonton, AB in 2011, 2012 and 2013.

AAFC National Potato Variety Evaluation

2011

Materials and Methods

The AAFC cultivar evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the full nitrogen rate was achieved through a combination of soil fertility (105 lbs./ac N; 214 lbs./ac P, 720 lbs./ac K), and broadcast fertilizer (350 lbs./ac of 34-17-0) incorporated at hilling. Cultivars were planted in two replicate rows in a randomized complete block design along with standard varieties. Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 13) to control weeds. Seed of standard cultivars and seed of test cultivars was provided by AAFC. Potatoes were planted May 18, 2011 approximately 12 to 14 cm deep using a two-row tuber unit planter. Seed was planted at 30 cm spacing in 6 m rows spaced 90 cm apart. Seed was (70 to 85 g) and suberized prior to planting.

The potatoes were hilled June 8 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 1). Insecticide was applied July 17 (Decis 5 EC, 50 mL/ac) to control Colorado potato beetle.

Table 1: Foliar fungicides applied to the potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
July 18	Bravo 500	0.64 L/ac
Aug 2	Bravo 500	0.64 L/ac
Aug 23	Dithane DG Rainshield	0.91 kg/ac

Figure 1: NPVT trial at CDCS in Brooks, AB August 18, 2011.

Reglone (1.4 L/ac) was applied September 6 and re-applied (1.0 L/ac) September 12 to facilitate mechanical harvest. Tubers were harvested September 19 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 10˚C until graded. Tubers were graded into size categories (less than 48mm, 48 – 88mm, and over 88mm). A sample of twenty-five tubers (48 – 88mm) from each replicate was used to determine specific gravity using the weight in air over weight in water method. These tubers were cut longitudinally to assess internal defects. Sub-samples of each cultivar were stored at 10˚C until other (culinary, bruise tests, cold storage) analyses could be performed. Post-harvest analyses were conducted by AAFC and data may be available from the breeder.

For comparison purposes, cultivar data has been grouped by intended end-use category.

The cultivars included in the replicated trials at CDCS, plus other novel cultivars for specialty markets, were grown at CDCN in demo plots. Field days were conducted at both locations. Data was only collected from the CDCS plots for this report.

Results – Chipping Cultivars

Sample hills of each cultivar were dug for a field day August 24, 2011. Photos of the chipping cultivars are shown in Figure 2.

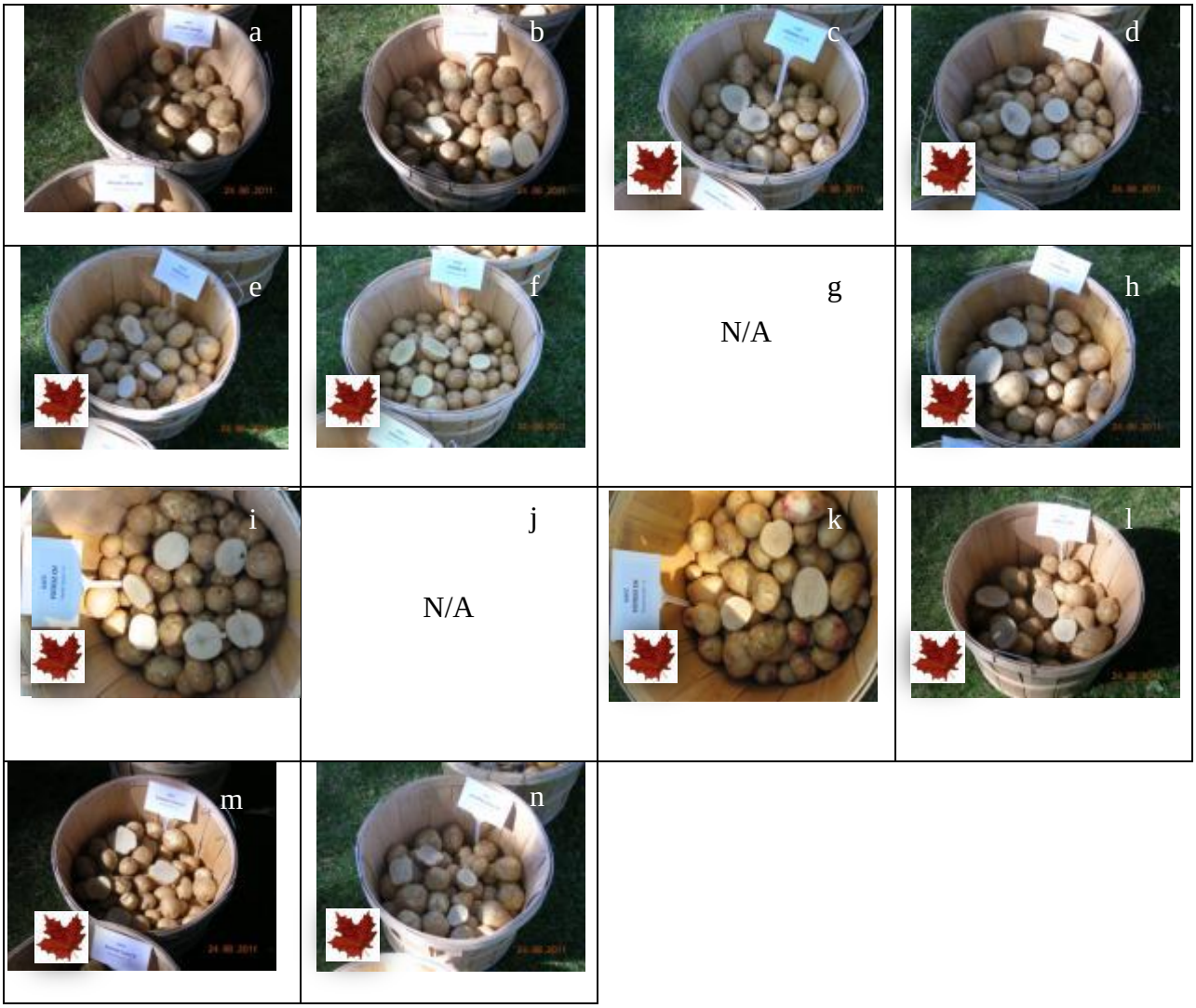

Figure 2. AAFC chipping cultivars at the CDCS field day August 24, 2011: a) Atlantic E., b) Atlantic W., c) CV96044-3, d) F06014, e) F07013, f) F07022, g) F07025 not shown, h) F07027, i) F07031, j) F07032, k) F07033, l) Snowden E., m) Snowden W., and n) V1351-3.

Yield data (total yield; ton/ac) and specific gravities of each of the chipping cultivars are shown in Table 2.

Table 2: Estimated total yield (ton/acre) and specific gravity for each chipping cultivar grown at CDCS in Brooks, AB (approximately 225 lbs./ac nitrogen). Data shown is the mean of two replicates.

2011 Chippers	Yield (ton/ac)	SG
Atlantic East	34.9	1.093
Atlantic West	32.3	1.092
CV96044-3	23.2	1.082
F06014	29.9	1.090
F07013	27.1	1.083
F07022	26.1	1.092
F07025	25.5	1.096
F07027	34.6	1.082
F07031	32.5	1.090
F07032	23.6	1.086
F07033	28.6	1.089
V1351-3	27.2	1.092
Snowden East	29.0	1.089
Snowden West	30.5	1.089

The mean percentage of total tuber number in each size category is shown in Table 3. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19 mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 3: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each chipping cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2011	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Atlantic East	11.6	74.1	13.6	0.8
Atlantic West	14.4	73.4	10.0	2.1
CV96044-3	40.8	57.5	1.4	0.4
F06014	21.5	75.4	2.9	0.2
F07013	12.5	78.9	8.5	0.0
F07022	41.7	58.3	0.0	0.0
F07025	14.4	80.8	4.7	0.0
F07027	17.6	64.8	16.3	1.3
F07031	16.7	66.3	16.5	0.5
F07032	36.2	63.6	0.2	0.0
F07033	24.6	74.1	1.3	0.0
V1351-3	20.0	71.9	8.1	0.0
Snowden East	15.4	81.0	2.6	0.2
Snowden West	9.7	83.0	7.0	0.3

The yield of tubers (estimated ton/ac) of each chipping cultivar is shown by size category in Table 4.

Table 4: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each chipping cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2011	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Atlantic East	1.8	23.7	9.1	0.4
Atlantic West	1.9	22.7	6.8	0.9
CV96044-3	4.4	17.7	1.1	0.1
F06014	3.0	24.4	2.3	0.2
F07013	1.8	21.3	4.1	0.0
F07022	6.2	19.9	0.0	0.0
F07025	1.9	21.1	2.6	0.0
F07027	2.5	20.6	11.2	0.3
F07031	1.8	20.7	9.9	0.2
F07032	4.4	19.1	0.2	0.0
F07033	3.1	24.3	1.1	0.0
V1351-3	1.4	21.5	4.2	0.1
Snowden East	2.6	20.7	5.8	0.0
Snowden West	2.7	25.8	2.0	0.1

Tuber samples used to measure specific gravity were evaluated for hollow heart, other internal defects and scab. There were very few internal defects observed in the tubers examined. Hollow heart was noted in a few tubers of the Atlantic, CV96044-3, F07025, F07031, F07032, F07033, and one tuber of Snowden and F07013. F07025, F07031, and Snowden had a few tubers with internal necrosis. Subsamples of F06014, F07022, F07027, and V1351-3 were free of any internal defects.

Common scab lesions were noted on a few tubers of CV96044-3, F07013, F07022, F07025, F07027, F07032 and Snowden.

Results– French Fry Cultivars

Sample hills of each cultivar were dug for a field day August 24, 2011. Photos of the French fry cultivars are shown in Figure 3.

Figure 3. AAFC French fry cultivars at the CDCS field day August 24, 2011: a) Shepody E., b) Shepody W., c) F07002, d) F07005, e) F07006, f) F07007, g) F07008, h) F07010, i) Ranger Russet, j) Russet Burbank E., and k) Russet Burbank W.,

Yield data (total yield; ton/ac) and specific gravities of each of the French fry cultivars are shown in Table 5.

Table 5: Estimated total yield (ton/acre) and specific gravity for each French fry cultivar grown at CDCS in Brooks, AB (approximately 225 lbs./ac nitrogen). Data shown is the mean of two replicates.

2011 French Fry	Yield (ton/ac)	SG
Shepody East	31.4	1.077
Shepody West	29.0	1.079
F07002	25.4	1.089
F07005	27.3	1.089
F07006	22.3	1.092
F07007	25.3	1.084
F07008	21.9	1.085
F07010	25.1	1.072
FV13830	28.7	1.076
Ranger Russet	26.1	1.087
Russet Burbank East	28.3	1.082
Russet Burbank West	27.2	1.083

The mean percentage of total tuber number in each size category is shown in Table 6. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19 mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 6: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each French fry cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2011	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Shepody E	22.9	70.6	4.4	2.2
Shepody W	24.7	68.7	1.1	5.4
F07002	19.1	74.1	4.0	2.8
F07005	28.3	68.8	1.6	1.3
F07006	24.4	66.7	6.7	2.4
F07007	48.6	49.9	0.0	1.5
F07008	48.6	50.1	0.0	1.3
F07010	19.3	77.0	2.7	0.9
FV13830	14.3	85.7	0.0	0.0
Ranger Russet	34.0	63.2	1.0	1.7
Russet Burbank E	41.3	56.8	0.2	2.2
Russet Burbank W	31.3	64.4	1.0	5.4

The yield of tubers (estimated ton/ac) of each chipping cultivar is shown by size category in Table 7.

Table 7: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each French fry cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2011	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Shepody E	1.8	24.4	4.2	1.1
Shepody W	2.2	22.8	0.9	3.0
F07002	1.9	20.2	2.4	1.0
F07005	2.9	22.4	1.5	0.5
F07006	1.9	16.0	4.4	0.5
F07007	6.4	18.1	0.0	0.8
F07008	5.6	15.9	0.0	0.5
F07010	1.9	21.3	1.7	0.3
FV13830	2.3	26.2	0.3	0.0
Ranger Russet	4.5	19.9	0.8	1.0
Russet Burbank E	6.1	21.2	0.3	0.8
Russet Burbank W	3.9	21.0	1.0	1.3

Tuber samples used to measure specific gravity were evaluated for hollow heart, other internal defects and scab. There were very few internal defects observed in the tubers examined. Hollow heart was noted in one or two tubers of the F07006 and F07008. Shepody E had one tuber with

internal necrosis. Subsamples of F07002, F07005, F07007, F07010, FV13830, Shepody W, Russet Burbank E and Russet Burbank W were free of any internal defects.

Common scab lesions were noted on one tuber in each subsample of F07002, F07005, F07006, F07008, F07010 and Shepody E.

Results – Fresh Market Cultivars

Sample hills of each cultivar were dug for a field day August 24, 2011. Photos of the yellow fresh market cultivars are shown in Figure 4.

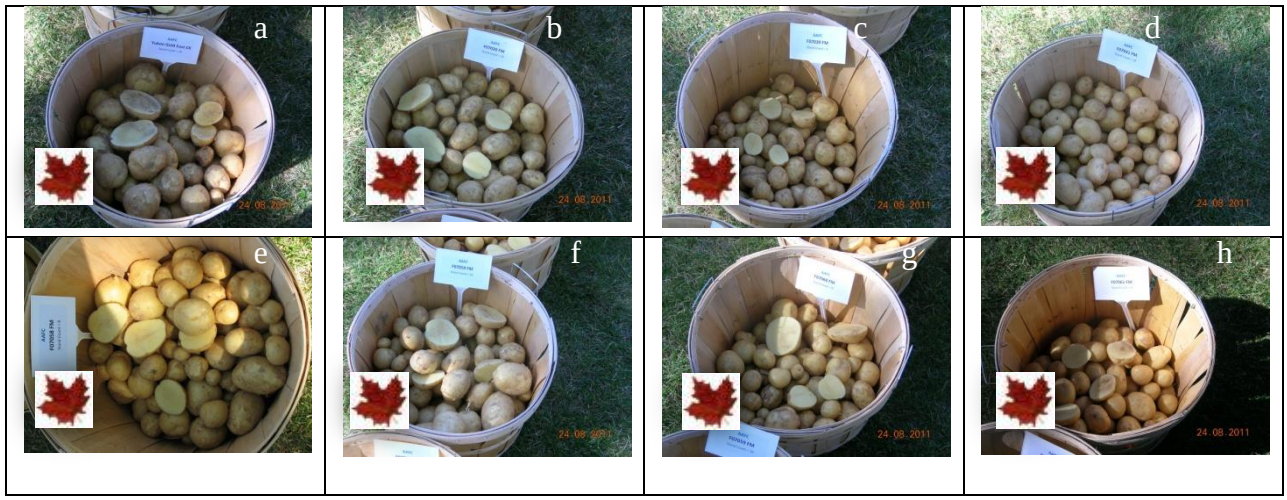

Figure 4. AAFC yellow fresh market cultivars at the CDCS field day August 24, 2011: a) Yukon Gold, b) F07020, c) F07039, d) F07041, e) F07058, f) F07059, g) F07060, and h) F07061.

Photos of the red-skinned fresh market cultivars are shown in Figure 5.

Figure 5. AAFC red-skinned fresh market cultivars at the CDCS field day August 24, 2011: a) Chieftain, b) Norland, c), F07038, d) F07043, e) F07045, f) F07047, g) F07048, h) F07049, i) F07063 not shown, j) V1414-1, and k) WV5843-6.

Photos of the white fresh market cultivars are shown in Figure 6.

Figure 6. AAFC white fresh market cultivars at the CDCS field day August 24, 2011: a) Kennebec, b) CV96044-3, c) F06027, d) F06037, e) F07040 not shown, f) F07071, g) V1255-3, h) and i) WV3252-1.

Photos of the novelty fresh market cultivars are shown in Figure 7.

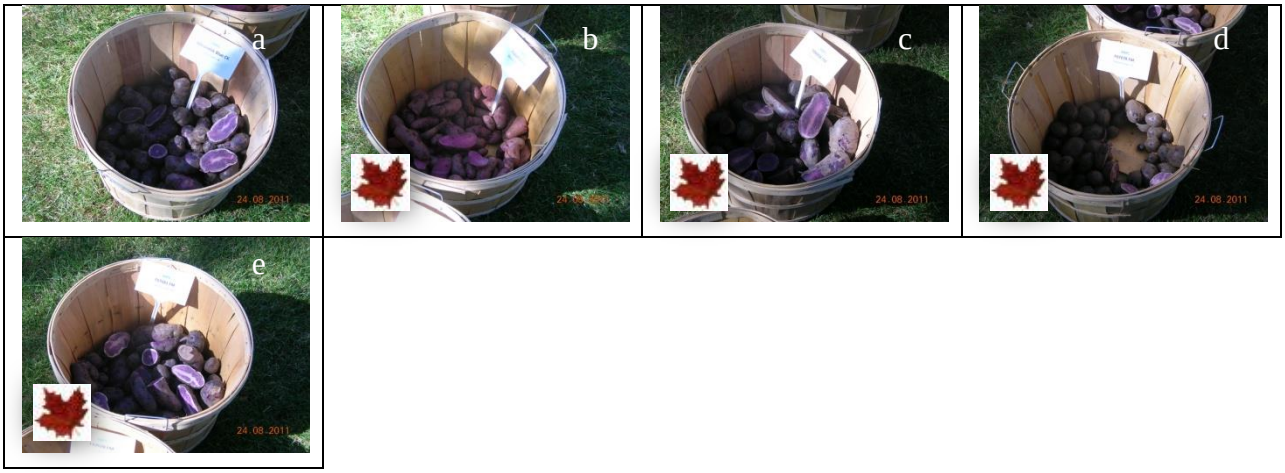

Figure 7. AAFC novelty fresh market cultivars at the CDCS field day August 24, 2011: a) Adirondak Blue, b) F06053, c) F06058, d) F07078, and e) F07081.

Yield data (total yield; ton/ac) and specific gravities of each of the fresh market cultivars are shown in Table 8.

Table 8: Estimated total yield (ton/acre) and specific gravity for each fresh market cultivar grown at CDCS in Brooks, AB (approximately 225 lbs./ac nitrogen). Data shown is the mean of two replicates.

2011 Fresh market	End Use†	Yield (ton/ac)	SG
Yellow			
Yukon Gold	FM	30.0	1.086
F07020	FM	28.5	1.089
F07039	FM/CR	28.4	1.076
F07041	FM	24.0	1.079
F07042	FM/CR	33.9	1.083
F07058	FM/CR	28.3	1.083
F07059	FM	29.0	1.080
F07060	FM	26.2	1.080
F07061	FM/CH	31.7	1.074
Red-skinned			
Chieftain	FM	31.8	1.077
Norland	FM	32.3	1.070
F07038	FM/CR	18.3	1.083
F07043	FM	29.0	1.084
F07045	FM	30.7	1.074
F07047	FM	28.0	1.085
F07048	FM/CR	25.4	1.080
F07049	FM/CR	22.1	1.081
F07063	FM	24.0	1.085
V1414-1	FM	28.3	1.071
WV5843-6	FM	30.9	1.063
White			
Kennebec	FM	31.9	1.081
CV96044-3	CH/FM/CR/GI	See Chipper data	
F06027	FM/FF	28.5	1.088
F06037	FM	35.3	1.085
F07040	FM/CR	16.8	1.077
F07071	FF/FM	32.5	1.102
V1255-3	FM/GI	27.4	1.079
WV3252-1	FM/CR/CH/GI	19.0	1.105
Novelty			
Adirondak Blue	FM/AO	24.4	1.080
F06053	FM/AO/FFN	19.0	1.071
F06058	FM/AO	33.4	1.070
F07078	FF/FM/AO	28.8	1.075
F07081	FM/FF/CH/AO	23.6	1.082

† AO = antioxidant, CH = chipper, CR = creamer, FF = French fry, FFN = functional food nutraceutical, FM = fresh market, GI = glycemic index, ST = starch

The mean percentage of total tuber number in each size category is shown in Table 9. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19 mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 9: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each fresh market cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2011	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Yellow				
Yukon Gold	10.8	71.0	17.2	1.0
F07020	16.6	82.3	1.1	0.0
F07039	44.3	55.7	0.0	0.0
F07041	35.1	64.3	0.4	0.2
F07042	27.6	71.7	0.0	0.7
F07058	23.5	70.5	6.0	0.0
F07059	23.7	70.4	4.8	1.1
F07060	26.3	67.8	4.6	1.3
F07061	26.1	68.4	4.1	1.4
Red-skinned				
Chieftain	24.4	71.2	4.4	0.0
Norland	17.3	69.3	12.8	1.2
F07038	36.7	63.3	0.0	0.0
F07043	22.1	73.1	4.0	0.7
F07045	18.2	80.1	1.0	0.2
F07047	30.0	69.4	0.6	0.0
F07048	55.6	44.3	0.0	0.1
F07049	78.2	21.8	0.0	0.0
F07063	25.8	73.2	0.6	0.5
V1414-1	28.1	65.4	5.9	0.5
WV5843-6	39.8	59.7	0.0	0.5
White				
Kennebec	23.5	68.8	5.1	2.6
CV96044-3	See data for chipping varieties			
F06027	34.4	65.6	0.0	0.0
F06037	21.5	75.2	3.0	0.3
F07040	75.9	23.6	0.0	0.5
F07071	17.3	79.6	2.9	0.3
V1255-3	28.4	69.1	0.9	1.5
WV3252-1	40.5	59.0	0.5	0.0
Novelty				
Adirondak Blue	61.2	38.6	0.0	0.2
F06053	83.8	14.2	0.0	2.0
F06058	21.2	67.3	2.5	9.0
F07078	33.4	64.9	0.0	1.7
F07081	26.9	72.2	0.5	0.4

The yield of tubers (estimated ton/ac) of each fresh market cultivar is shown by size category in Table 10.

Table 10: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each fresh market cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2011	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Yellow	1.8	24.4	4.2	1.1
Yukon Gold	1.2	18.7	9.7	0.5
F07020	2.2	25.5	0.8	0.0
F07039	7.1	21.3	0.0	0.0
F07041	3.9	19.8	0.3	0.1
F07042	4.2	29.2	0.0	0.4
F07058	2.6	21.7	4.0	0.0
F07059	2.0	22.6	4.2	0.2
F07060	2.7	20.3	3.0	0.3
F07061	3.3	24.5	3.3	0.6
Red-skinned				
Chieftain	2.6	25.6	3.7	0.0
Norland	1.6	22.6	7.8	0.5
F07038	3.9	14.4	0.0	0.0
F07043	2.0	13.6	3.2	0.3
F07045	2.4	27.5	1.4	0.2
F07047	4.2	23.3	0.5	0.0
F07048	9.0	16.4	0.0	0.1
F07049	14.0	8.1	0.0	0.0
F07063	2.9	20.6	0.4	0.2
V1414-1	3.4	21.1	3.1	0.7
WV5843-6	6.3	24.3	0.0	0.4
White				
Kennebec	3.1	24.1	3.8	0.8
CV96044-3	See data for chipping varieties			
F06027	4.2	24.3	0.0	0.0
F06037	2.5	30.0	2.6	0.2
F07040	10.8	5.9	0.0	0.2
F07071	2.0	27.9	2.5	0.1
V1255-3	3.4	23.1	0.6	0.4
WV3252-1	4.5	14.2	03	0.0
Novelty				
Adirondak Blue	10.1	14.2	0.0	0.1
F06053	13.6	4.9	0.0	0.5
F06058	2.5	23.4	2.3	5.3
F07078	4.6	23.2	0.0	1.0
F07081	2.4	20.8	0.4	0.0

Tuber samples used to measure specific gravity were evaluated for hollow heart, other internal defects and scab. There were very few internal defects observed in the tubers examined. Hollow

heart was noted in several tubers of Yukon Gold and F07047. F07059, F07060, F07063 and Norland subsamples each had one tuber with internal necrosis. Subsamples of all of the other varieties were free of any internal defects.

Common scab lesions (1%) were noted in at least one subsample of F06027, F07039, F07040, F07042, F07048, F07059, F07060, F07078, F07081, Norland, V1255-3, V1414-1, WV3252-1, and Yukon Gold.

2012

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility (225 lbs./ac) was achieved through a combination of soil fertility (60 lbs./ac N; 187 lbs./ac P, 810 lbs./ac K), broadcast fertilizer (176 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting and broadcast fertilizer (280 lbs./ac 34-0-0) incorporated at hilling. Varieties were planted in four replicate rows in a randomized complete block design along with standard varieties (Andover, Atlantic, Snowden, Russet Burbank, Ranger Russet, Shepody, Adirondak Blue, Chieftain, Kennebec, Norland, Sangre and Yukon Gold). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 10) to control weeds. Seed was cut (70 to 85 g) if necessary and suberized prior to planting. Potatoes were planted May 18, 2012 approximately 5 to 5½"deep using a two-row tuber unit planter. Seed was planted at 30cm spacing in 6m rows spaced 90cm apart.

The potatoes were hilled June 4 with a disc hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 1). Insecticide was applied July 17 (Matador 120 EC, 40 mL/ac) and August 15 (Decis, 50 mL/ac) to control Colorado potato beetle.

Table 11: Foliar fungicides applied to the potato crop in 2012 to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
June 29	Bravo 500	0.64 L/ac
July 27	Ridomil Gold Bravo	883 mL/ac
Aug 15	Bravo 500	0.64 L/ac

Figure 8: NPVT trial at CDCS in Brooks, AB July 20, 2012.

Reglone (1.4 L/ac) was applied August 28 to facilitate mechanical harvest. Tubers were harvested September 11 - 13 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 8˚C until graded. Tubers were graded into size categories (less than 48mm, 48 – 88mm, and over 88mm). A sample of twenty-five tubers (48 – 88mm) from each replicate was used to determine specific gravity using the weight in air over weight in water method. These tubers were cut longitudinally to assess internal defects. Sub-samples of each cultivar were stored at 10˚C until other (culinary, bruise tests, cold storage) analyses could be performed. Post-harvest analyses were conducted by AAFC and data may be available from the breeder.

Results shown are the means of two replicates. For comparison purposes, cultivar data has been grouped by intended end-use category.

The cultivars included in the replicated trials at CDCS, plus other novel cultivars for specialty markets, were grown at CDCN in demo plots. Field days were conducted at both locations. Data was only collected from the CDCS plots for this report.

Results – Chipping Cultivars

Sample hills of each cultivar were dug for a field day August 22, 2012. Photos of the chipping cultivars are shown in Figure 9.

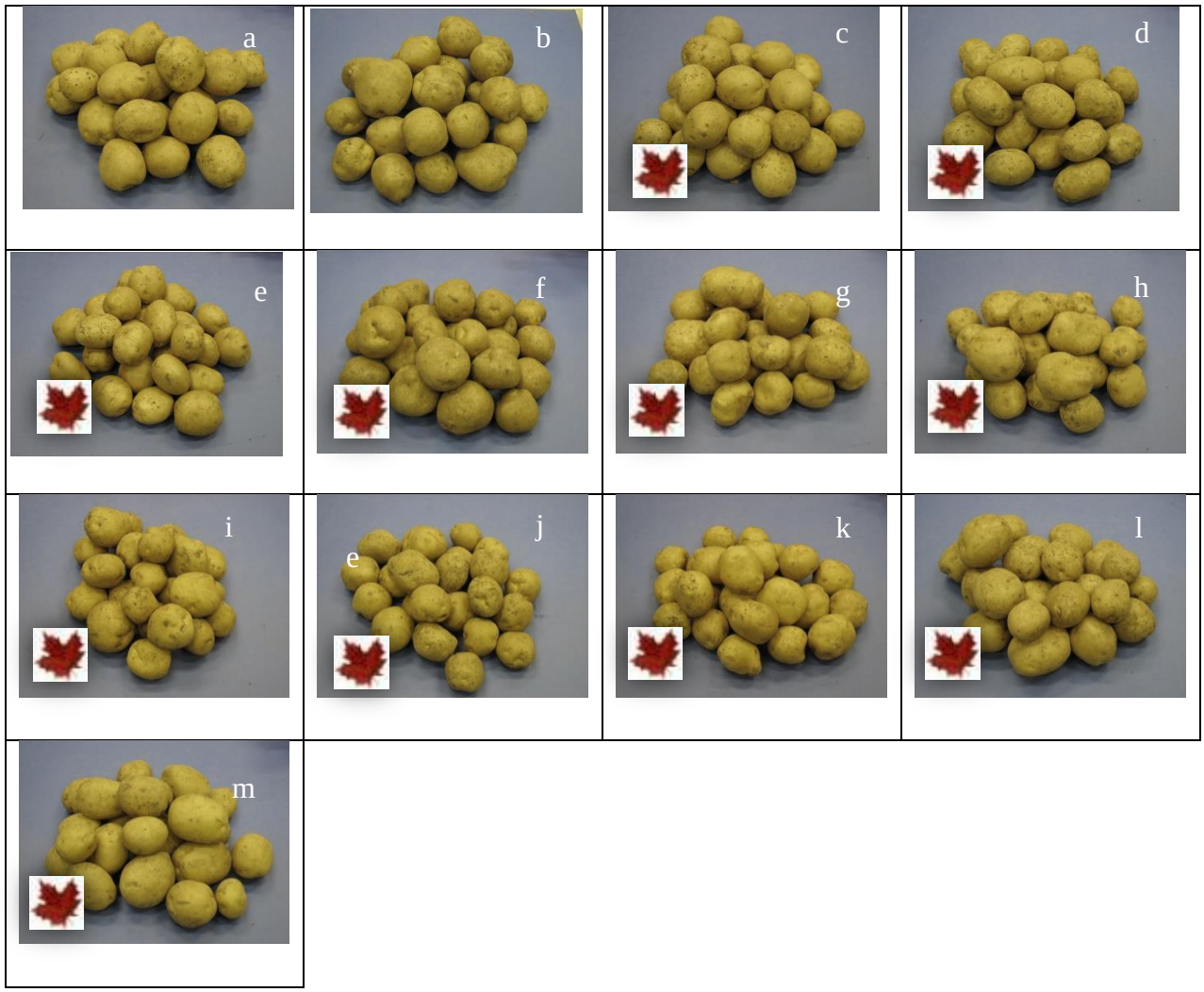

Figure 9: AAFC **chipping** cultivars grown at the CDCS in 2012: a) Andover., b) Atlantic W., c) CV97065-1, d) F07026, e) F08011, f) F08021, g) F08022, h) F08809, i) Snowden E., j) Snowden W., k) V05217-1, l) V1687-2 and m) WV4479-1.

Yield data (total yield; ton/ac) and specific gravities of each of the chipping cultivars are shown in Table 12.

Table 12: Estimated total yield (ton/acre) and specific gravity for each chipping cultivar grown at CDCS in Brooks, AB (approximately 225 lbs./ac nitrogen). Data shown is the mean of two replicates.

2012 Chipping	Yield (ton/ac)	SG
Andover	21.0	1.072
Atlantic West	27.9	1.085
CV97065-1	23.6	1.073
F07026	19.3	1.083
F08011	28.5	1.075
F08021	22.3	1.072
F08022*	3.6	1.063
F08809*	3.8	1.070
Snowden East	23.2	1.076
Snowden West	26.3	1.078
V05217-1	26.5	1.069
V1687-2	28.3	1.064
WV4479-1	26.8	1.068

* Plants affected by herbicide.

The mean percentage of total tuber number in each size category is shown in Table 13. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19 mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 13: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each chipping cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2012	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Andover	28.3	69.8	0.8	1.1
Atlantic West	25.8	65.9	6.4	1.9
CV97065-1	26.0	73.0	0.1	0.0
F07026	38.5	61.3	0.0	0.2
F08011	43.1	53.2	2.0	1.6
F08021	23.4	72.8	3.9	0.0
F08022*	44.6	52.1	3.4	0.0
F08809*	52.8	47.2	0.0	0.0
Snowden East	40.4	58.5	0.9	0.2
Snowden West	32.7	66.2	1.1	0.0
V05217-1	37.5	59.3	1.5	1.7
V1687-2	28.5	70.3	1.0	0.2
WV4479-1	38.1	59.0	2.3	0.6

* Plants affected by herbicide.

The yield of tubers (estimated ton/ac) of each chipping cultivar is shown by size category in Table 14.

Table 14: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each chipping cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2012	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Andover	2.4	17.6	0.6	0.3
Atlantic West	2.1	20.1	4.9	0.6
CV97065-1	2.6	20.1	0.8	0.0
F07026	4.3	14.7	0.0	0.1
F08011	5.4	20.1	2.2	0.7
F08021	1.8	18.2	2.3	0.0
F08022*	0.7	2.5	0.4	5.7
F08809*	1.0	2.8	0.0	0.0
Snowden East	4.2	18.0	0.8	0.1
Snowden West	4.1	21.1	0.9	0.0
V05217-1	4.2	20.1	1.3	0.8
V1687-2	2.8	24.3	0.9	0.4
WV4479-1	4.2	20.5	1.9	0.1

* Plants affected by herbicide.

Tuber samples used to measure specific gravity were evaluated for hollow heart, other internal defects and scab. There were very few internal defects observed in the tubers examined. Hollow heart and/or brown center were noted in a couple of Atlantic tubers. Some tubers from most samples exhibited stem-end discoloration and this may be an indication that plants were not fully mature prior to desiccation. Common scab lesions were not noted for any cultivars.

Results– French Fry Cultivars

Sample hills of each cultivar were dug for a field day August 22, 2012. Photos of the French fry cultivars are shown in Figure 10.

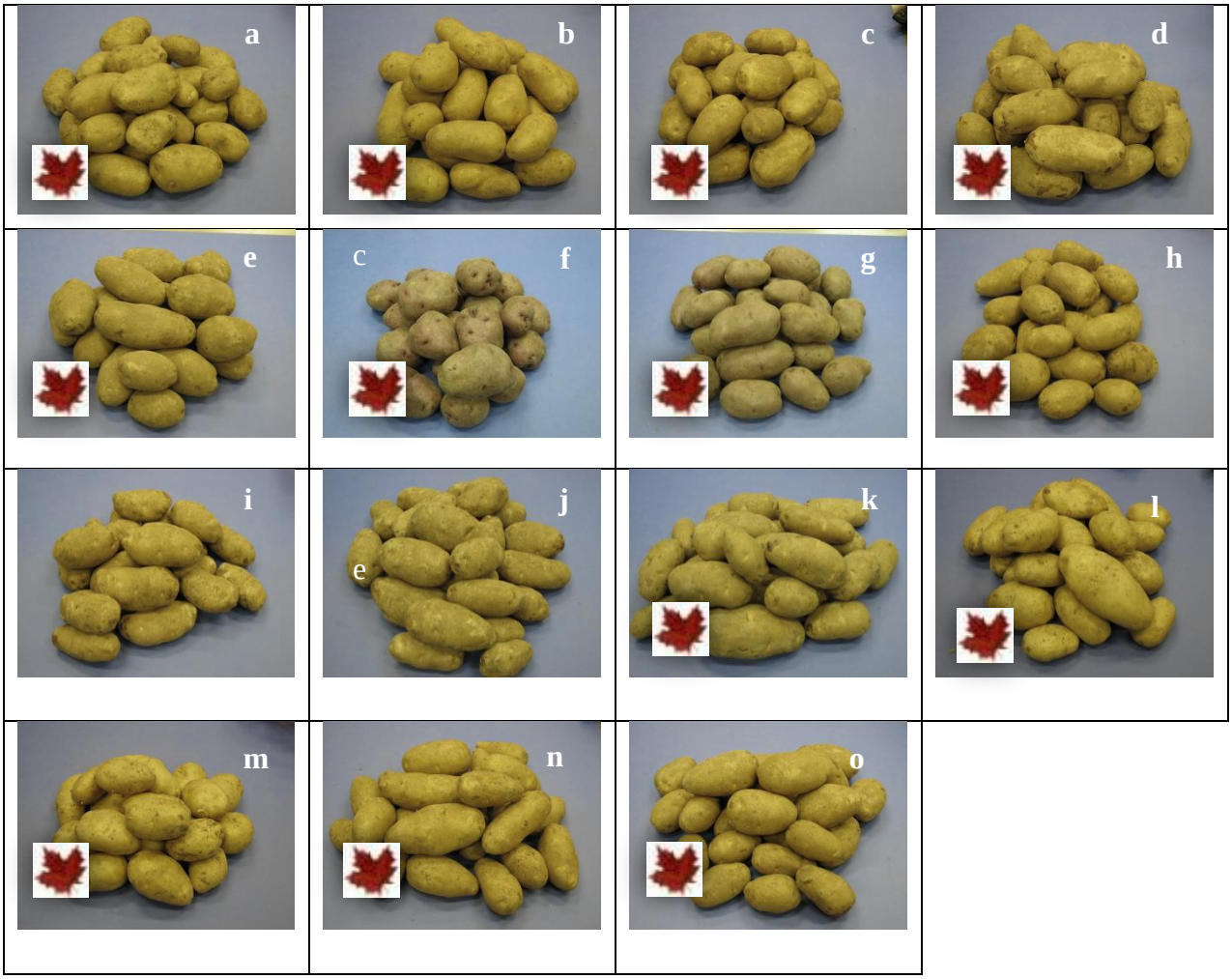

Figure 10: AAFC **French fry** cultivars grown at the CDCS in 2012: a) CV96022-3, b) F07001, c) V07002 d) F07007, e) F08001, f) F08003, g) F08099, h) FV15223-09, i) Russet Burbank E, j) Russet Burbank W, k). Ranger Russet/Amisk, l).Shepody E, m) Shepody W, n) WV3667-1, and o) WV4993-1

Yield data (total yield; ton/ac) and specific gravities of each of the French fry cultivars are shown in Table 15.

Table 15: Estimated total yield (ton/acre) and specific gravity for each French fry cultivar grown at CDCS in Brooks, AB (approximately 225 lbs./ac nitrogen). Data shown is the mean of two replicates.

2012 French Fry	Yield (ton/ac)	SG
CV96022-3	25.0	1.099
F07001	29.5	1.089
F07002	19.7	1.091
F07007	25.4	1.089
F08001	21.1	1.092
F08003	26.0	1.073
F08099	26.2	1.080
FV15223-09	26.8	1.094
R. Burbank East	25.3	1.090
R. Burbank West	29.5	1.087
Ranger R/Amisk	29.7	1.098
Shepody East	17.4	1.081
Shepody West	22.0	1.089
WV3667-1	23.9	1.101
WV4993-1	25.2	1.091

The mean percentage of total tuber number in each size category is shown in Table 16. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19 mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 16: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each French fry cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2012	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
CV96022-3	32.4	66.1	0.2	0.9
F07001	30.6	68.7	0.0	1.1
F07002	29.1	61.4	4.9	5.3
F07007	40.6	56.4	0.3	4.5
F08001	37.0	63.0	0.0	0.0
F08003	23.4	73.0	1.9	2.2
F08099	78.0	21.8	0.0	1.3
FV15223-09	28.1	70.4	0.7	1.1
R. Burbank East	57.2	41.1	0.0	4.0
R. Burbank West	71.1	27.1	0.0	5.9
Ranger R/Amisk	43.5	55.7	0.0	1.4
Shepody East	46.3	45.3	2.0	10.4
Shepody West	34.8	62.6	0.8	2.7
WV3667-1	48.5	51.5	0.0	0.0
WV4993-1	41.7	55.3	1.7	2.2

The yield of tubers (estimated ton/ac) of each chipping cultivar is shown by size category in Table 17.

Table 17: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each French fry cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2012	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
CV96022-3	4.0	20.4	0.3	0.2
F07001	4.6	24.1	0.0	0.6
F07002	1.5	14.4	2.9	0.9
F07007	4.3	19.4	0.3	1.3
F08001	3.5	17.6	0.0	0.0
F08003	1.9	21.8	1.3	1.0
F08099	9.8	15.8	0.0	0.5
FV15223-09	2.7	23.0	0.6	0.4
R. Burbank East	8.4	15.2	0.0	1.7
West	7.3	19.1	0.0	2.9
Ranger R/Amisk	5.7	23.2	0.0	0.7
Shepody East	4.4	9.9	2.3	0.6
Shepody West	2.8	17.7	0.5	1.0
WV3667-1	6.1	17.6	0.0	0.0
WV4993-1	4.7	18.6	1.2	0.5

Tuber samples used to measure specific gravity were evaluated for hollow heart, other internal defects and scab. There were very few internal defects observed in the tubers examined. Hollow heart was noted in several tubers of WV3667-1. Some tubers from most samples exhibited stem-end discoloration and this may be an indication that plants were not fully mature prior to desiccation. Internal pigmentation was noted for some F08001 tubers.

Common scab lesions were not noted tubers in these subsamples

Results – Fresh Market Cultivars

Sample hills of each cultivar were dug for a field day August 22, 2012. Photos of the yellow fresh market cultivars are shown in Figure 11.

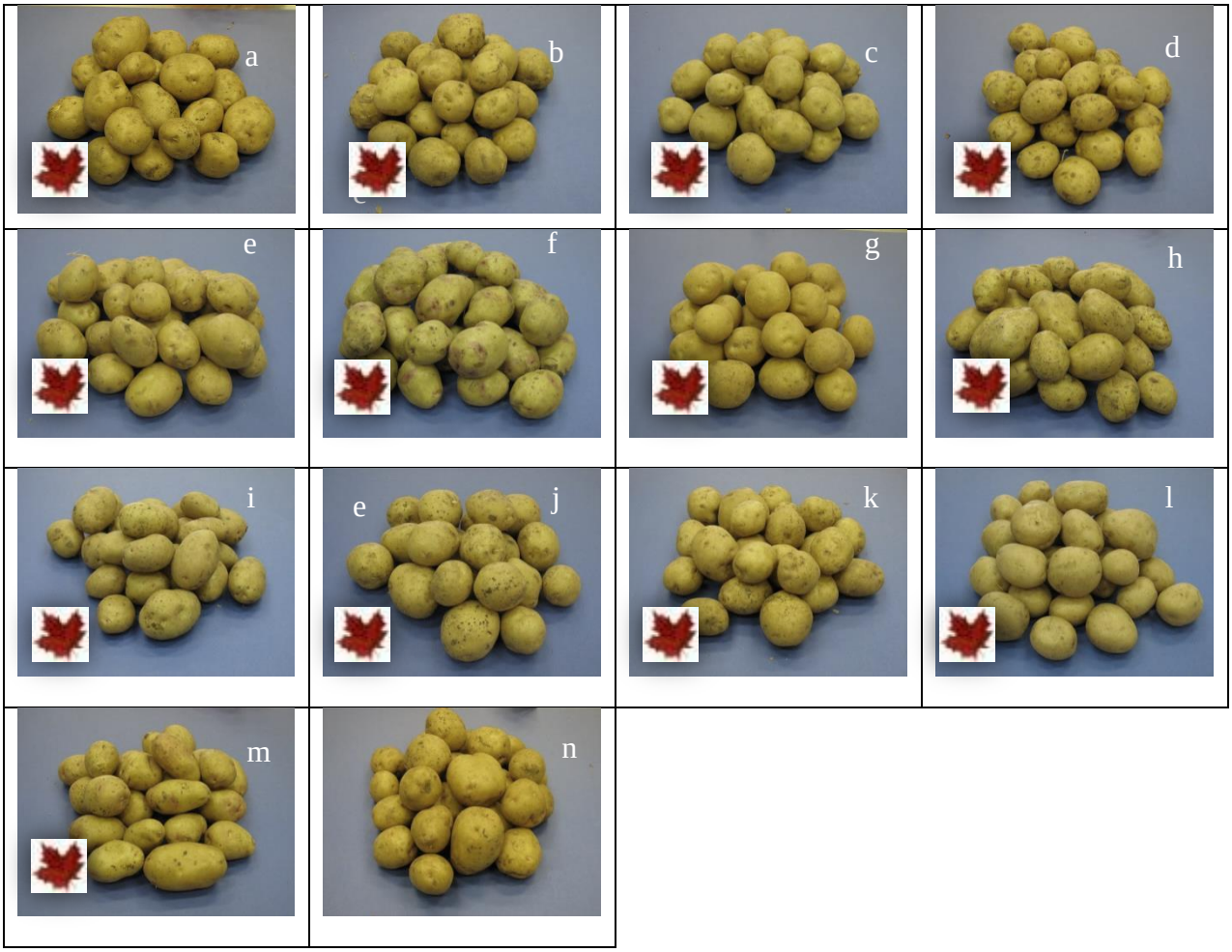

Figure 11: AAFC **yellow fresh market** cultivars at the CDCS field day August 22, 2012: a) CV05122-1, b) F06049, c) F07020, d) F7039, e) F7041, f) F7042, g) F07061, h) F08031, i) F08040, j) F08047, k) F08048, l) F08050, m) F08086, and n) Yukon Gold.

Photos of the red-skinned fresh market cultivars are shown in Figure 12.

Figure 12: AAFC red-skinned fresh market cultivars at the CDCS field day August 22, 2012: a) CV99161-5, b) CV99256-2, c) F06051, d) F07038, e) F07043, f) F08037, g) F08039, h) F08051, i) F08052, j) F08053, k) F05084, l) F08055, m) F08056, n) F08061, o) F08075, p) F08087, q) Chieftain, r) Norland, and s) Sangre.

Photos of the white fresh market cultivars are shown in Figure 13.

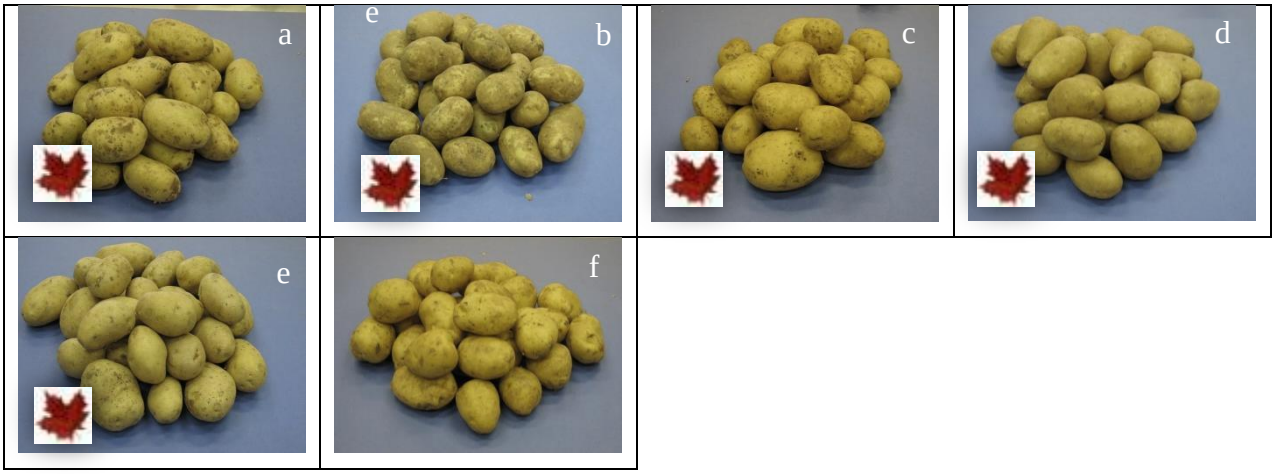

Figure 13: AAFC white fresh market cultivars at the CDCS field day August 22, 2012: a) F08008 and b) F08028, c) F08033, d) F08069, e) V115-3, and f) Kennebec.

Photos of the purple or blue cultivars are shown in Figure 14.

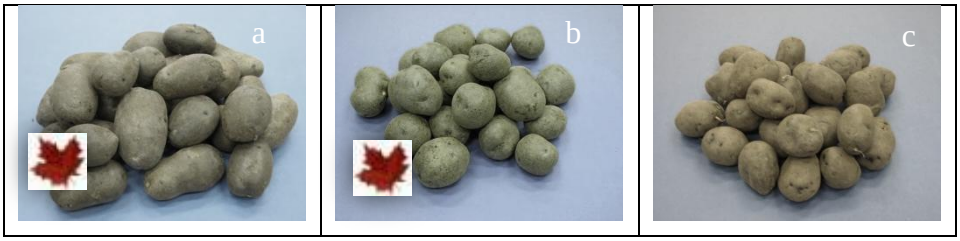

Figure 14: AAFC purple fresh market cultivars at the CDCS field day August 22, 2012: a) F06058, b) F08101 and b) Adirondak Blue.

Yield data (total yield; ton/ac) and specific gravities of each of the fresh market cultivars are shown in Table 18.

Table 18: Estimated total yield (ton/acre) and specific gravity for each fresh market FM) cultivar grown at CDCS in Brooks, AB (approximately 225 lbs./ac nitrogen). Data shown is the mean of two replicates.

2012 Fresh Market	End Use	Yield (ton/ac)	SG
Yellow			
CV05122-1	FM	29.7	1.087
F06049	FM	23.4	1.092
F07020	FM	22.7	1.089
F07039	FM	22.7	1.075
F07041	FM	24.3	1.086
F07042	FM	16.4	1.080
F07061	FM	29.9	1.076
F08031	FM	36.3	1.077
F08040	FM	30.1	1.084
F08047	FM	26.0	1.097
F08048	FM	23.6	1.082
F08050	FM	32.0	1.086
F08086	FM	28.1	1.085
Yukon Gold	FM	26.6	1.083
Red-skinned			
CV99161-5	FM	23.7	1.081
CV99256-2	FM	24.6	1.086
F06051	FM	19.1	1.078
F07038	FM	22.6	1.084
F07043	FM	30.2	1.086
F08037	FM	26.3	1.092
F08039	FM	36.3	1.082
F08051	FM	26.7	1.079
F08052	FM	12.7	1.083
F08053	FM	28.7	1.079
F08054	FM	22.1	1.076
F08055	FM	26.2	1.086
F08056	FM	26.6	1.076
F08061	FM	20.9	1.073
F08075	FM	27.0	1.081
F08087	FM	29.2	1.076
Chieftain	FM	34.0	1.081
Norland	FM	30.7	1.071
Sangre	FM	29.3	1.080
White/Russet			
F08008	FM	27.5	1.087
F08028	FM	25.7	1.088
F08033	FM	30.8	1.090
F08069	FM	26.3	1.096
V115-3	FM	26.6	1.081
Kennebec	FM	28.5	1.079
Anti-Oxidant			
F06058	FM/AO	24.0	1.067
F08101	FM/AO	29.0	1.084
Adirondak Blue	FM/AO	18.3	1.078

The mean percentage of total tuber number in each size category is shown in Table 19. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19 mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 19: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each fresh market cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2012	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Yellow				
CV05122-1	16.5	76.8	6.4	0.2
F06049	36.4	61.8	0.9	0.8
F07020	39.4	60.0	0.7	0.0
F07039	61.3	38.2	0.0	0.5
F07041	38.8	60.3	0.4	0.5
F07042	67.8	29.1	0.2	2.9
F07061	32.9	63.3	1.9	2.0
F08031	20.3	77.3	2.0	0.4
F08040	42.8	56.3	0.0	0.9
F08047	41.7	56.8	0.8	0.8
F08048	33.4	65.2	1.2	0.2
F08050	35.5	61.6	2.1	0.9
F08086	56.1	43.0	0.0	0.9
Yukon Gold	19.2	74.3	5.6	1.0
Red-skinned				
CV99161-5	38.4	60.9	0.0	0.7
CV99256-2	43.9	55.4	0.2	0.6
F06051	74.7	24.5	0.4	0.4
F07038	54.6	45.4	0.0	0.0
F07043	24.7	74.0	0.8	0.6
F08037	54.7	45.3	0.0	0.0
F08039	26.9	67.7	5.0	0.4
F08051	45.7	53.3	0.2	0.9
F08052	56.5	43.5	0.0	0.0
F08053	45.1	53.4	1.4	0.2
F08054	47.5	52.3	0.2	0.0
F08055	41.3	57.0	1.6	0.0
F08056	45.2	50.5	3.5	0.8
F08061	41.5	50.2	6.2	2.2
F08075	30.1	64.3	5.1	0.5
F08087	22.2	75.1	2.2	0.5
Chieftain	20.1	77.9	1.3	0.7
Norland	26.7	69.2	3.4	0.7
Sangre	29.2	66.2	4.3	0.2
White/Russet				
F08008	39.7	58.8	0.3	1.2
F08028	44.0	55.6	0.3	0.0
F08033	25.8	70.7	2.3	1.2
F08069	46.6	52.3	0.2	0.8
V115-3	39.9	58.9	1.2	0.0
Kennebec	29.3	64.9	3.6	2.2
Anti-Oxidant				
F06058	45.4	50.1	2.2	2.4
F08101	46.9	53.1	0.0	0.0
Adirondak Blue	44.8	53.5	0.6	1.1

The yield of tubers (estimated ton/ac) of each fresh market cultivar is shown by size category in Table 20.

Table 20: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each fresh market cultivar grown at approximately 225 lbs./ac. Data shown is the mean of two replicates.

2012	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Yellow				
CV05122-1	2.8	22.4	4.3	0.1
F06049	3.5	18.9	0.7	0.3
F07020	4.3	17.5	0.6	0.0
F07039	9.0	13.1	0.0	0.2
F07041	4.1	19.5	0.4	0.2
F07042	5.5	9.5	0.2	1.1
F07061	3.5	23.2	2.0	0.8
F08031	2.4	31.4	2.0	0.3
F08040	6.3	22.9	0.0	0.7
F08047	4.9	20.0	0.7	0.3
F08048	3.2	19.1	1.0	0.1
F08050	4.9	24.5	2.1	0.4
F08086	8.6	18.6	0.0	0.6
Yukon Gold	1.3	21.5	3.5	0.2
Red-skinned				
CV99161-5	5.3	18.1	0.0	0.3
CV99256-2	5.4	18.7	0.2	0.2
F06051	8.3	7.8	0.5	0.3
F07038	7.3	13.7	0.0	0.0
F07043	3.0	26.0	0.7	0.2
F08037	8.8	17.1	0.0	0.0
F08039	3.1	27.3	5.2	0.2
F08051	6.1	19.8	0.2	0.3
F08052	3.3	9.5	0.0	0.0
F08053	6.2	20.4	1.5	0.1
F08054	5.7	16.1	0.1	0.0
F08055	4.8	19.8	1.5	0.0
F08056	4.7	18.2	3.2	0.3
F08061	2.9	13.3	4.0	0.6
F08075	2.8	20.0	4.0	0.1
F08087	2.0	25.9	1.8	0.2
Chieftain	2.5	29.8	1.1	0.2
Norland	3.9	24.4	1.7	0.3
Sangre	2.6	23.0	3.5	0.0
White/Russet				
F08008	5.3	21.1	0.2	0.7
F08028	7.1	17.6	0.7	0.0
F08033	3.0	25.3	2.0	0.4
F08069	6.5	18.7	0.2	0.6
V115-3	5.6	19.5	1.3	0.0
Kennebec	2.7	22.1	2.6	0.9
Anti-Oxidant				
F06058	5.0	16.4	1.7	0.8
F08101	7.1	21.3	0.0	0.0
Adirondak Blue	4.2	13.2	0.4	0.4

Tuber samples used to measure specific gravity were evaluated for hollow heart, other internal defects and scab. There were few internal defects observed in the tubers examined. Hollow heart was noted in one tuber of CV99256-2, Adirondak Blue and Kennebec. Brown centre was noted in one or more tubers of F06058, F07038, F07039, F07041, F08047, F08048, F08052, F08053 and F08056. Adirondak Blue and F08101 exhibited some purple pigmentation. Some tubers from most samples exhibited some stem-end discoloration and this may be an indication that plants were not fully mature prior to desiccation.

Rhizoctonia scurf (1 to 5%) was noted on most tubers. No seed piece treatments were applied in this trial.

2013

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility (235 lbs./ac) was achieved through a combination of soil fertility (124 lbs./ac N; 361 lbs./ac P, 1930 lbs./ac K), broadcast fertilizer (165 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting and broadcast fertilizer (132 lbs./ac 34-0-0) incorporated at hilling. Varieties were planted in four replicate rows in a randomized complete block design along with standard varieties (Atlantic, Snowden, Russet Burbank, Ranger Russet, Shepody, Norland, Sangre and Yukon Gold). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 6) to control weeds. Seed of standard cultivars was provided by Edmonton Potato Growers and seed of test cultivars was provided by each participant. Seed was cut (70 to 85 g) if necessary and suberized prior to planting. Potatoes were planted May 14, 2013 approximately 5 to 5½"deep using a two-row tuber unit planter. Seed was planted at 30cm spacing in 6m rows spaced 90cm apart.

The potatoes were hilled June 5 with a disc hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 21). Insecticide was applied July 10 (Matador 120 EC, 40 mL/ac) to control Colorado potato beetle.

Table 21: Foliar fungicides applied to the potato crop in 2013 to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
July 10	Quadris	202 mL/ac
July 20	Bravo 500	0.64 L/ac
Aug 15	Ridomil Gold Bravo	883 mL/ac

Figure 15: NPVT trial at CDCS in Brooks, AB July 30, 2013.

Reglone (1.4 L/ac) was applied September 4 to facilitate mechanical harvest. Tubers were harvested September 12 - 13 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 8˚C until graded. Tubers were graded into size categories (less than 48mm, 48 – 88mm, and over 88mm). A sample of twenty-five tubers (48 – 88mm) from each replicate was used to determine specific gravity using the weight in air over weight in water method. These tubers were cut longitudinally to assess internal defects. Sub-samples of each cultivar were stored at 10˚C until other (culinary, bruise tests, cold storage) analyses could be performed. Post-harvest analyses were conducted by AAFC and data may be available from the breeder.

Results shown are the means of two replicates. For comparison purposes, cultivar data has been grouped by intended end-use category.

The cultivars included in the replicated trials at CDCS, plus other novel cultivars for specialty markets, were grown at CDCN in demo plots. Field days were conducted at both locations. Data was only collected from the CDCS plots for this report.

Results – Chipping Cultivars

Sample hills of each cultivar were dug for a field day August 22, 2013. Photos of the chipping cultivars are shown in Figure 16.

Figure 16. AAFC chipping cultivars at the CDCS field day August 22, 2013: a) Atlantic E., b) Atlantic W., c) F07026, d) F09020, e) F09026, f) FV12246-6, g) FV15079-10, h) FV15559-79, i) Snowden E., j) Snowden W., and k) V05073-2.

Yield data (total yield; ton/ac) and specific gravities of each of the chipping cultivars are shown in Table 22.

Table 22: Estimated total yield (ton/acre) and specific gravity for each chipping cultivar grown at CDCS in Brooks, AB (approximately 235 lbs./ac nitrogen). Data shown is the mean of two replicates.

	Yield (ton/ac)	SG
Atlantic East	28.4	1.096
Atlantic West	31.1	1.106
F07026	20.5	1.095
F09020	36.2	1.099
F09026	19.0	1.087
FV12246-6	36.5	1.100
FV15079-10	25.6	1.080
FV15559-79	23.8	1.088
Snowden East	28.9	1.094
Snowden West	26.0	1.102
V05073-2	21.0	1.093

The mean percentage of total tuber number in each size category is shown in Table 23. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19 mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 23: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each chipping cultivar grown at approximately 235 lbs./ac. Data shown is the mean of two replicates.

	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Atlantic East	25.0%	59.0%	11.0%	5.0%
Atlantic West	18.0	77.0	5.0	0.0
F07026	39.0	60.0	1.0	0.0
F09020	19.5	69.5	9.0	1.5
F09026	36.0	64.0	0.0	0.0
FV12246-6	26.5	66.0	3.5	5.0
FV15079-10	29.0	67.0	4.0	0.0
FV15559-79	36.0	64.0	0.0	0.0
Snowden East	23.0	74.0	3.0	0.0
Snowden West	26.0	71.0	3.0	0.0
V05073-2	43.0	57.0	0.5	0.0

The yield of tubers (estimated ton/ac) of each chipping cultivar is shown by size category in Table 24.

Table 24: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each chipping cultivar grown at approximately 235 lbs./ac. Data shown is the mean of two replicates.

	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Atlantic East	1.8	17.4	7.3	1.9
Atlantic West	1.5	26.2	3.4	0.1
F07026	4.2	15.7	0.7	0.0
F09020	2.1	25.5	7.3	1.4
F09026	3.6	15.4	0.0	0.0
FV12246-6	3.5	26.2	4.0	2.8
FV15079-10	2.8	19.6	3.23	0.0
FV15559-79	4.4	19.1	0.3	0.0
Snowden East	2.5	23.8	2.5	0.0
Snowden West	2.9	20.7	2.3	0.0
V05073-2	4.7	15.9	0.4	0.0

Tuber samples used to measure specific gravity were evaluated for hollow heart, other internal defects and scab. There were very few internal defects observed in the tubers examined. Hollow heart and/or brown center were noted in a few tubers of the Atlantic, Snowden, F09026, and V05073-2. Some tubers from each sample exhibited stem-end discoloration and this may be an indication that plants were not fully mature prior to desiccation.
Common scab lesions were only noted on a few tubers of F07026.

Results– French Fry Cultivars

Sample hills of each cultivar were dug for a field day August 22, 2013. Photos of the French fry cultivars are shown in Figure 17.

Figure 17. AAFC French fry cultivars at the CDCS field day August 22, 2013: a) CV00031-3., b) CV04218-1., c) F07001, d) F09001, e) F09003, f) F09005, g) Russet Burbank E, h) Russet Burbank W, i) Ranger Russet/Amisk, j) Shepody E, k) Shepody W, and l) WV9120-2

Yield data (total yield; ton/ac) and specific gravities of each of the French fry cultivars are shown in Table 25.

Table 25: Estimated total yield (ton/acre) and specific gravity for each French fry cultivar grown at CDCS in Brooks, AB (approximately 235 lbs./ac nitrogen). Data shown is the mean of two replicates.

	Yield (ton/ac)	SG
CV00031-3	21.2	1.083
CV04218-1	24.8	1.070
F07001	30.4	1.080
F09001	30.4	1.091
F09003	27.8	1.078
F09005	24.1	1.078
R. Burbank East	34.8	1.089
R. Burbank West	29.9	1.087
Ranger R/Amisk	31.5	1.092
Shepody East	28.4	1.075
Shepody West	27.2	1.084
WV9120-2	26.5	1.089

The mean percentage of total tuber number in each size category is shown in Table 26. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19 mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 26: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each French fry cultivar grown at approximately 235 lbs./ac. Data shown is the mean of two replicates.

	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
CV00031-3	26.2%	71.3%	1.2%	1.4%
CV04218-1	30.9	63.8	2.0	3.4
F07001	24.8	69.1	0.0	6.2
F09001	30.8	66.3	1.5	1.4
F09003	20.0	76.7	1.5	1.8
F09005	38.0	61.7	0.0	0.3
R. Burbank East	32.5	64.5	0.0	2.9
West	34.8	55.1	1.3	8.8
Ranger R/Amisk	34.9	64.4	0.2	0.5
Shepody East	22.6	59.0	7.9	10.4
Shepody West	24.8	65.7	4.5	5.1
WV9120-2	42.5	57.1	0.2	0.2

The yield of tubers (estimated ton/ac) of each chipping cultivar is shown by size category in Table 27.

Table 27: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each French fry cultivar grown at approximately 235 lbs./ac. Data shown is the mean of two replicates.

	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
CV00031-3	2.1	17.8	0.8	0.5
CV04218-1	2.8	19.2	1.6	1.2
F07001	2.7	25.5	0.0	2.2
F09001	3.6	25.0	1.3	0.5
F09003	2.0	24.0	1.3	0.5
F09005	5.0	19.0	0.0	0.1
East	5.2	28.5	0.0	1.1
West	3.7	19.6	1.1	5.5
Ranger R/Amisk	4.9	26.0	0.3	0.3
Shepody East	2.1	17.0	5.2	4.1
Shepody West	2.0	19.2	3.1	2.9
WV9120-2	5.5	20.7	0.3	0.0

Tuber samples used to measure specific gravity were evaluated for hollow heart, other internal defects and scab. There were very few internal defects observed in the tubers examined. Hollow

heart was noted in several tubers of F07001, Russet Burbank, Shepody and WV9120-2. Some tubers from each sample exhibited stem-end discoloration and this may be an indication that plants were not fully mature prior to desiccation.

Common scab lesions were only noted on one tuber in each subsample of F09001 and several tubers in the Shepody W subsample.

Results – Fresh Market Cultivars

Sample hills of each cultivar were dug for a field day August 22, 2013. Photos of the yellow fresh market cultivars are shown in Figure 18.

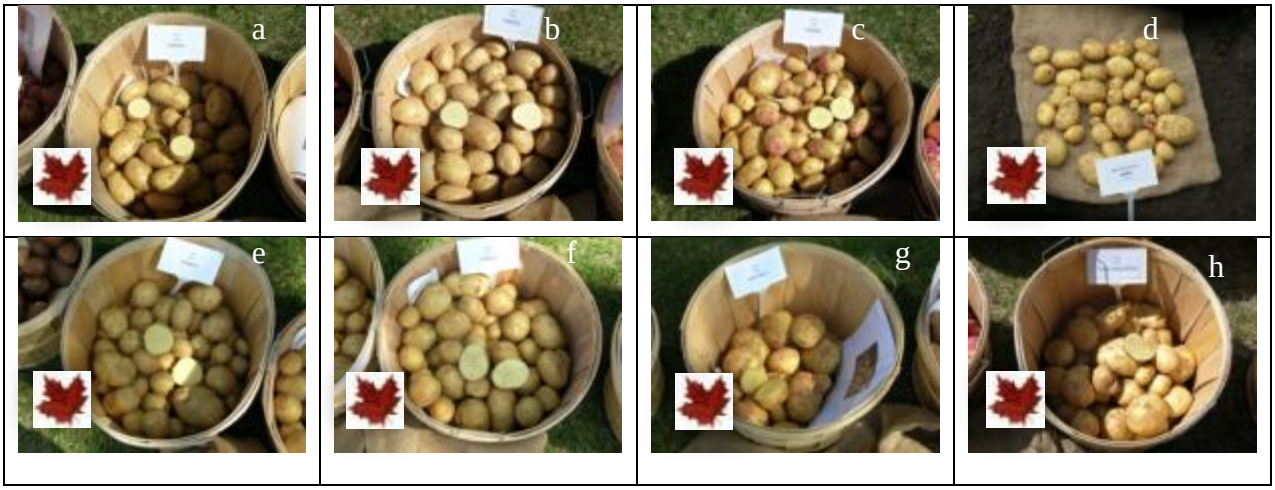

Figure 18. AAFC yellow fresh market cultivars at the CDCS field day August 22, 2013: a) F08003, b) F08050, c) F08086, d) F09053, e) F09054, f) F09065, g) V07148-2, and h) Yukon Gold.

Photos of the red-skinned fresh market cultivars are shown in Figure 19.

Figure 19. AAFC red-skinned fresh market cultivars at the CDCS field day August 22, 2013: a) CV05239-1, b) CV07366-2, c) CV97050-3, d) F08037, e) F08039, f) F08051, g) F08053, h) F08055, i) F09038, j) Norland, and k) Sangre.

Photos of the white fresh market cultivars are shown in Figure 20.

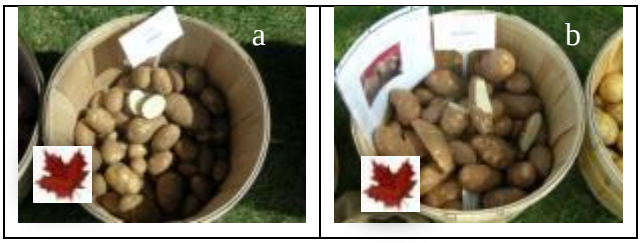

Figure 20. AAFC white fresh market cultivars at the CDCS field day August 22, 2013: a) F09030 and b) WV7868-1.

Yield data (total yield; ton/ac) and specific gravities of each of the fresh market cultivars are shown in Table 28.

Table 28: Estimated total yield (ton/acre) and specific gravity for each fresh market FM) cultivar grown at CDCS in Brooks, AB (approximately 235 lbs./ac nitrogen). Data shown is the mean of two replicates.

	End Use	Yield (ton/ac)	SG
Yellow			
F08003	FM	26.6	1.097
F08050	FM	33.7	1.088
F08086	FM	33.0	1.093
F09053	FM	18.3	1.082
F09054	FM	20.2	1.091
F09065	FM	32.1	1.087
V07148-2	FM	29.0	1.075
Yukon Gold	FM	27.2	1.091
Red-skinned			
CV05239-1	FM	34.7	1.076
CV07366-2	FM	31.1	1.081
CV97050-3	FM	28.1	1.084
F08037	FM	24.4	1.094
F08039	FM	37.4	1.089
F08051	FM	29.3	1.084
F08053	FM	34.7	1.081
F08055	FM	32.4	1.086
F09038	FM	34.5	1.084
Norland	FM	31.7	1.069
Sangre	FM	28.5	1.084
White			
F09030	FM	27.1	1.089
WV7868-1	FM	24.8	1.077

The mean percentage of total tuber number in each size category is shown in Table 29. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19 mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 29: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each fresh market cultivar grown at approximately 235 lbs./ac. Data shown is the mean of two replicates.

	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Yellow				
F08003	29.2	70.4	0.0	0.4
F08050	23.5	72.8	2.6	1.1
F08086	50.1	49.8	0.2	0.0
F09053	21.0	56.3	19.9	2.3
F09054	19.7	75.6	4.0	0.8
F09065	21.2	77.7	1.0	0.0
V07148-2	32.1	64.2	3.4	0.2
Yukon Gold	12.0	83.3	4.7	0.0
Red-skinned				
CV05239-1	23.2	71.6	4.3	0.9
CV07366-2	20.8	75.8	2.0	1.4
CV97050-3	23.8	57.9	5.4	12.9
F08037	39.2	60.8	0.0	0.0
F08039	20.1	76.0	3.4	0.5
F08051	32.9	65.6	1.5	0.0
F08053	26.1	67.4	6.3	0.2
F08055	13.7	80.6	5.3	0.4
F09038	20.3	76.8	2.3	0.6
Norland	18.4	74.8	4.2	2.6
Sangre	27.6	69.2	3.2	0.0
White				
F09030	44.2	55.3	0.4	0.2
WV7868-1	36.4	55.3	1.3	7.0

The yield of tubers (estimated ton/ac) of each fresh market cultivar is shown by size category in Table 30.

Table 30: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each fresh market cultivar grown at approximately 235 lbs./ac. Data shown is the mean of two replicates.

	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Yellow				
F08003	4.3	22.1	0.2	0.0
F08050	3.0	27.6	2.7	0.4
F08086	9.0	23.8	0.2	0.0
F09053	0.9	10.1	6.4	0.8
F09054	1.2	16.9	2.0	0.2
F09065	2.4	28.8	1.0	0.0
V07148-2	3.8	21.8	3.2	0.2
Yukon Gold	0.9	22.6	3.7	0.0
Red-skinned				
CV05239-1	3.0	27.7	3.7	0.4
CV07366-2	2.6	26.3	1.7	0.5
CV97050-3	1.7	19.0	3.6	3.7
F08037	5.3	19.2	0.0	0.0
F08039	2.8	30.7	3.6	0.3
F08051	3.8	24.1	1.4	0.0
F08053	2.9	26.1	5.7	0.1
F08055	1.5	26.6	4.2	0.1
F09038	2.5	29.5	2.1	0.3
Norland	1.7	25.4	3.3	1.4
Sangre	2.9	22.6	31	0.0
White				
F09030	6.8	19.8	0.4	0.1
WV7868-1	3.4	17.0	1.4	2.6

Tuber samples used to measure specific gravity were evaluated for hollow heart, other internal defects and scab. There were very few internal defects observed in the tubers examined. Hollow heart or brown center was noted in a few tubers of CV05239-1, F08050, F08053, F08055, F09053, F09065, Norland, and WV7868-1. F08053 exhibited some purple pigmentation and internal necrosis. Some tubers from each sample exhibited stem-end discoloration and this may be an indication that plants were not fully mature prior to desiccation.

Common scab lesions (1%) were noted in at least one subsample of F08053, F09030, F09038, and F09065.

Conclusions

Each year of the trial included a number of cultivars with potential in southern Alberta. In 2011, Atlantic and Snowden were included in the trial as standard varieties to compare to chipping cultivars. Russet Burbank and Shepody were included in the trial as standard varieties to compare French fry cultivars with. Yukon Gold, Chieftain, Norland, Kennebec and Adirondak Blue were included in the trial as standard varieties to compare with fresh market cultivars.

In 2012, Andover, Atlantic and Snowden were included in the trial as standard varieties to compare to chipping cultivars. Russet Burbank, Ranger Russet (Amisk) and Shepody were included in the trial as standard varieties to compare French fry cultivars with. Yukon Gold, Kennebec, Adirondak Blue, Chieftain, Norland, and Sangre were included in the trial as standard varieties to compare with fresh market cultivars.

In 2013, Atlantic and Snowden were included in the trial as standard varieties to compare to chipping cultivars. Russet Burbank and Shepody were included in the trial as standard varieties to compare French fry cultivars with. Yukon Gold, Norland, and Sangre were included in the trial as standard varieties to compare with fresh market cultivars.

The trial was designed to provide regional data for a wide range of potato cultivars. All cultivars were planted at the same in-row spacing, the N rate was approximately 225 lbs./ac to 235 lbs/ac, and harvest was scheduled for full-season varieties. Addressing the agronomic needs, such as plant density, fertility requirements, and harvest timing for each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

French Fry Variety Evaluation

2011

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the full nitrogen rate was achieved through a combination of soil fertility (105 lbs./ac N; 214 lbs./ac P, 720 lbs./ac K), and broadcast fertilizer (350 lbs./ac of 34-17-0) incorporated at hilling. Fertility for the low nitrogen rate was achieved through a combination of soil fertility and broadcast fertilizer (100 lbs./ac of 11-52-0) incorporated at hilling. Varieties were planted in four replicate rows in a randomized split block design (with fertility as the main block) along with a standard variety (Russet Burbank). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 13) to control weeds. Seed of standard cultivars was provided by BPS Ltd. and seed of test cultivars was provided by each participant. Most varieties were planted May 30, 2011 approximately 5 to 5½"deep using a two-row tuber unit planter. Mini-tubers were received late and were hand planted June 6. Seed was planted at 30cm spacing in 6m rows spaced 90cm apart. Seed was planted as single drop with the exception of some of the larger varieties. Cut seed (70 to 85 g) was suberized prior to planting.

The potatoes were hilled June 8 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 31). Insecticide was applied July 17 (Decis 5 EC, 50 mL/ac) to control Colorado potato beetle.

Table 31: Foliar fungicides applied to the potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
July 18	Bravo 500	0.64 L/ac
Aug 2	Bravo 500	0.64 L/ac
Aug 23	Dithane DG Rainshield	0.91 kg/ac

Figure 21: Variety evaluation trial at CDCS in Brooks, AB July 22, 2011.

Reglone (1.4 L/ac) was applied September 6 and re-applied (1.0 L/ac) September 12 to facilitate mechanical harvest. Tubers were harvested September 21 – 26 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 10˚C until graded. Tubers were graded into weight categories (less than 4 oz., 4 – 6 oz., 6 – 10 oz., over 10 oz. and deformed). A sample of twenty-five tubers (over 6 oz.) from each replicate was used to determine specific gravity using the weight in air over weight in water method. The length and diameter of each tuber in the specific gravity sample was recorded and the tubers were cut longitudinally to assess internal defects. A composite sample of 8 tubers (2 per rep) was stored at 8˚C until culinary analyses could be performed. Samples were evaluated for French fry scores Dec. 1.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request.

Results and Discussion

Sample hills of each variety were dug for a field day August 24, 2011. Photos of these varieties are shown in Figure 22.

Figure 22. French fry varieties at the CDCS field day August 24, 2011: a) Alpine Russet, b) Blazer Russet, c) Coaldale 1, d) Coaldale 2, e) Coaldale 3, f) Coaldale 4, g) Coaldale 5, h) Owyhee Russet, i) Russet Burbank.

Yield data (total yield and marketable yield; ton/ac), mean marketable tuber weight (oz.) and specific gravities of each of the varieties are shown in Table 32.

The highest total yield was observed with Coaldale 3 on regular N, and total yield of Coaldale 5, LW 002, LW 003 and Russet Burbank were not statistically less than Coaldale 3. Only one variety, Blazer Russet was evaluated on low N. Total yield of Blazer Russet was significantly less on low N than on regular N in this trial. Likely the difference in N level was too great and more work may be required to identify an optimal rate of N for this variety. The highest mean marketable tuber weight was observed with Coaldale 1 although it was not statistically different from Coaldale 4 or Russet Burbank. The smallest mean tuber size was observed with Owyhee Russet and Alpine Russet as expected. Both of these varieties were grown from mini-tubers that were planted later than the main crop. These varieties will need to be assessed again using regular seed potatoes planted at the same time as the comparison varieties.

Table 32: Estimated total yield and marketable yield (ton/acre), mean weight of marketable tubers, tuber length to width (L/W) ratio and specific gravity for each variety grown at full nitrogen (approximately 225 lbs./ac) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2011 French Fry	Yield (ton/ac)	Yield over 4 oz. (ton/ac)	Mean Tuber weight (oz.)	Tuber L/W ratio	SG
Regular Fertility					
Alpine Russet	19.0 c	12.5 c	6.0 c	-	1.080 b
Blazer Russet	23.4 b	20.3 ab	8.6 b	1.69 bc	1.077 b
Coaldale 1	20.0 c	17.6 b	10.8 a	1.72 bc	1.080 b
Coaldale 2	19.1 c	16.0 b	7.8 bc	1.91 a	1.085 ab
Coaldale 3	30.6 a	25.0 a	8.6 b	1.70 bc	1.076 b
Coaldale 4	20.5 c	18.6 a	10.0 ab	1.63 c	1.090 ab
Coaldale 5	27.4 ab	19.7 ab	6.4 bc	1.63 c	1.076 b
LW 001*	18.6 c	13.9 bc	6.9 bc	1.38 de	1.095 a
LW 002*	23.7 ab	19.3 ab	7.4 bc	1.63 cd	1.082 b
LW 003*	30.2 ab	21.3 ab	7.8 bc	1.37 e	1.086 ab
Owyhee Russet	18.6 c	9.2 c	5.5 c	-	1.082 b
Russet Burbank*	25.4 abc	22.4 ab	8.7 ab	1.90 ab	1.087 ab
Low Fertility					
Blazer Russet	18.6†	15.5†	8.1		1.075

* Seed of the check variety was cut and treated before delivery. Planting delays resulted in poor emergence and low stand count of the check variety. Data from two replicates at an alternate site was used for comparison purposes. No comparison check data was available for the low N plots.
†Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

The mean length to width ratio of tubers in the SG sample is shown in Table 32. Coaldale 2 had the highest ratio and was not statistically different from Russet Burbank. A ratio near 1.0 indicates a round potato and a ratio of 2.0 indicates that the tubers are twice as long as they are wide. Blazer Russet, Coaldale 1 and Coaldale 3 were not statistically different from Russet Burbank. LW 001 and LW 003 were more oval than long in shape.

LW 001 had the highest specific gravity on regular N, but this was not statistically different from Coaldale 4, Russet Burbank, LW 003 and Coaldale 2. The lowest specific gravity was observed with Coaldale 5 and Coaldale 3, and these were not statistically lower than Blazer Russet, Alpine Russet, Coaldale 1, Coaldale 2, Coaldale 3, Coaldale 4, Coaldale 5, LW 002, LW 003, Russet Burbank, and Owyhee Russet at regular N. The specific gravity of Blazer Russet on low N plots was not statistically different from that on regular N.

The trial was designed to provide regional data for a wide range of potato cultivars. The N rate in the low N plots was over 100 lbs./ac lower than the regular rate. A rate of N that is intermediate may give better results than either full or low N. Addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

The mean percentage of total tuber number in each weight category is shown in Table 33. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 33: Percentage of total tuber number in each weight category (< 4oz., 4 to 6 oz., 6 to 10 oz. > 10 oz., and deformed) for each variety grown at full nitrogen (approximately 225 lbs./ac) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2011	< 4oz.	4 to 6 oz.	6 to 10 oz.	> 10 oz.	Deformed
Regular N					
Alpine Russet	54.0 ab	28.6 a	14.8 bc	1.92 c	0.65
Blazer Russet	28.4 c	19.9 ab	29.5 ab	21.1 ab	0.92
Coaldale 1	28.4 c	15.0 b	22.7 ab	32.3 ab	1.57
Coaldale 2	30.2 c	24.1 ab	32.3 a	13.0 bc	0.37
Coaldale 3	27.0 c	20.4 ab	30.6 ab	19.1 b	2.93
Coaldale 4	22.1 c	15.7 b	27.0 ab	33.4 a	1.77
Coaldale 5	47.9 b	26.1 ab	21.5 b	3.9 c	0.55
LW 001*	41.3 bc	25.8 ab	24.4 abc	6.6 bc	1.99
LW 002*	34.1 bc	24.5 ab	31.2 ab	9.1 bc	1.11
LW 003*	50.7 ab	18.1 ab	18.4 bc	10.9 bc	1.90
Owyhee Russet	66.7 a	23.6 ab	8.7 c	1.5 c	0.20
Russet Burbank*	23.7 c	22.8 ab	28.7 ab	23.1 ab	1.74
Low N					
Blazer Russet	25.5	22.3	32.8	17.3	2.00

†Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

As a result of a late planting date and planting mini-tubers, Owyhee Russet and Alpine Russet produced the greatest percentage of potatoes in the small (< 4 oz.) category, although not statistically different from LW 003. Coaldale 2 produced the greatest percentage of tubers in the 6 to 10 oz. category and LW 002, Coaldale 3, Blazer Russet, Russet Burbank, Coaldale 4, LW 001, and Coaldale 1 were not statistically different. Coaldale 4 yielded the greatest percentage of tubers over 10 oz. and Coaldale 1, Russet Burbank and Blazer Russet were not statistically different. There were no statistically significant differences in the deformed size category.

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 34. Coaldale 3 gave the greatest yield of 6 to 10 oz. potatoes but was not statistically different from LW 002, Coaldale 5, LW 003, Russet Burbank, and Blazer Russet. Coaldale 1 and Coaldale 4 resulted in the greatest yield of large (> 10 oz.) potatoes, although this was not statistically greater than most other varieties because of variability within the data set. There were no statistically significant differences in the deformed size categories from regular N plots.

Table 34: Estimated yield (ton/ac) in each weight category (< 4oz., 4 to 6 oz., 6 to 10 oz. > 10 oz., and deformed) for each variety grown at full nitrogen (approximately 225 lbs./ac) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2011	< 4oz.	4 to 6 oz.	6 to 10 oz.	> 10 oz.	Deformed
Regular N					
Alpine Russet	6.0 a	6.5 b	4.9 bc	1.1 ab	0.3
Blazer Russet	2.3 ab	3.4 c	7.6 ab	9.3 ab	0.4
Coaldale 1	1.6 b	1.8 c	4.2 bc	11.5 a	0.4
Coaldale 2	2.8 ab	3.6 bc	7.2 b	5.2 ab	0.1
Coaldale 3	3.0 ab	4.2 bc	10.1 a	10.7 ab	2.0
Coaldale 4	1.2 b	1.9 c	5.3 bc	11.5 a	0.5
Coaldale 5	6.9 ab	7.7 a	9.3 ab	2.7 ab	0.4
LW 001*	3.5 ab	4.4 bc	6.5 b	3.0 ab	0.7
LW 002*	3.4 ab	4.9 bc	9.5 ab	4.9 ab	0.5
LW 003*	6.8 a	5.1 bc	8.1 ab	8.2 ab	1.3
Owyhee Russet	9.2 a	5.5 bc	3.1 c	0.5 b	0.1
Russet Burbank*	1.7 ab	4.0 bc	7.7 ab	10.6 ab	0.8
Low N					
Blazer Russet	1.8†	2.6	6.6	6.3	0.6

†Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

Fry scores are presented in Table 35. The Coaldale varieties and the LW varieties were evaluated by the sponsor and data is not available for this report. All of the varieties evaluated had lighter fry colour than Russet Burbank. All of the varieties except Alpine Russet had a mealy texture, suitable for French fries. The Alpine Russet sample may not have been fully mature given the late planting date. Colour uniformity was more variable for Russet Burbank than for the other varieties evaluated. Blazer Russet grown on low N had a darker fry score than when grown on regular N.

Table 35: Fry scores: Fry Colour was assessed visually by comparison with a USDA fry colour chart (000 to 4; the lower the score, the better the fry colour). Data shown is the result of one composite sample run in duplicate.

2011

Regular N	Fry Colour	Internal Texture[1]	Colour Uniformity[2]
Alpine Russet	USDA 0	3	3
Blazer Russet	USDA 0	4	3
Owyhee Russet	USDA 0	4	3
Russet Burbank*	USDA 2	4	2
Low N			
Blazer Russet	USDA 1	4	2

[1] Internal texture: 1 (wet) - 4 (mealy)
[2] Color uniformity: 1 (very variable) - 5 (very uniform)

Tuber samples used to measure specific gravity were evaluated for hollow heart, brown centre, stem-end discoloration, other types of internal necrosis and scab. There were no internal defects noted for Alpine Russet, Coaldale 2, Coaldale 3, Coaldale 4, Coaldale 5, LW 001, LW 002 or Owyhee Russet. One rep of Blazer Russet had several tubers with hollow heart. Hollow heart was noted in a few tubers of Coaldale 1. LW 003 showed stem end discoloration in two tubers, possibly related to tuber maturity. Russet Burbank samples had a few tubers in each rep with hollow heart, brown centre or stem end discoloration.

2012

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the full nitrogen rate (248 lbs/ac) was achieved through a combination of soil fertility (82 lbs./ac N; 192 lbs./ac P, 760 lbs./ac K), broadcast fertilizer (176 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting and broadcast fertilizer (280 lbs./ac 34-0-0) incorporated at hilling. Fertility for the reduced nitrogen rate (150 lbs./ac) was achieved through a combination of soil fertility and broadcast fertilizer (176 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting. Varieties were planted in four replicate rows in a randomized split block design (with fertility as the main block) along with standard varieties (Russet Burbank, Ranger Russet, and Shepody). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 10) to control weeds. Seed of standard cultivars was provided by Edmonton Potato Growers and seed of test cultivars was provided by each participant. Most varieties were planted May 23, 2012 approximately 5 to 5½"deep using a two-row tuber unit planter. Seed was planted at 30cm spacing in 6m rows spaced 90cm apart. Seed was cut (70 to 85 g) and suberized prior to planting.

The potatoes were hilled June 4 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 36). Insecticide was applied July 17 (Matador 120 EC, 40 mL/ac) and August 15 (Decis 5 EC, 50 mL/ac) to control Colorado potato beetle.

Table 36: Foliar fungicides applied to the potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
June 29	Bravo 500	0.64 L/ac
July 27	Ridomil Gold Bravo	883 mL/ac
Aug 15	Bravo 500	0.64 L/ac

Figure 23: Variety evaluation trial at CDCS in Brooks, AB July 20, 2012.

Reglone (1.4 L/ac) was applied September 13 to facilitate mechanical harvest. Tubers were harvested September 18-25 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 8˚C until graded. Tubers were graded into weight categories (less than 4 oz., 4 – 6 oz., 6 – 10 oz., over 10 oz. and deformed). A sample of twenty-five tubers (over 6 oz.) from each replicate was used to determine specific gravity using the weight in air over weight in water method. The length and diameter of each tuber in the specific gravity sample was recorded and the tubers were cut longitudinally to assess internal defects. Sub-samples were provided to customers for storage evaluation as requested.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request.

Results and Discussion

Sample hills of each variety were dug for a field day August 22, 2012. Photos of some of the varieties are shown in Figure 24.

Figure 24. French fry varieties at the CDCS field day August 22, 012: a) Russet Burbank, b) Ranger Russet, c) Owyhee Russet (not shown) d) Coaldale 1, e) Coaldale 3 and f) Coaldale 6.

Yield data (total yield and marketable yield; ton/ac), mean marketable tuber weight (oz.) and specific gravities of each of the varieties are shown in Table 37. The highest total yield was observed with Owyhee Russet on regular N, and total yield of other varieties was not statistically different. Clearwater Russet was an exception, but yield was impacted by herbicide carryover in the seed and the yield in this trail is likely not a reflection of the potential for this variety in southern Alberta. Owyhee Russet also produced the greatest total yield on reduced N plots, and total yield of the other varieties in the trial was not statistically different. Owyhee Russet produced the greatest marketable yield at both levels of N. Marketable yield of Owyhee Russet was significantly different than marketable yield of Coaldale 6 and Coaldale 7, but not other varieties. Marketable yield of Owyhee Russet was not statistically different from that of the check varieties at the reduced rate of N. The highest mean marketable tuber weight was observed with Blazer Russet and Owyhee Russet although not statistically different from other varieties. For varieties grown at a reduced rate of N, Blazer Russet produced the largest mean marketable tuber size, but was not statistically different from the check varieties.

Table 37: Estimated total yield and marketable yield (ton/acre), mean weight of marketable tubers, tuber length to width (L/W) ratio and specific gravity for each variety grown at full nitrogen (approximately 248 lbs./ac) and reduced nitrogen (approximately 150 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2012 French Fry	Yield (ton/ac)	Yield over 4 oz. (ton/ac)	Mean Tuber weight (oz.)	SG
Regular N Fertility				
Russet Burbank	32.4 a	22.5 ab	7.7 ab	1.086 ab
Ranger Russet	27.5 ab	21.0 ab†	7.8 ab	1.095 b
Alpine Russet	27.2 ab†	22.7 ab†	8.2 ab	1.089 ab†
Blazer Russet	30.3 ab	27.9 a	10.4 a	1.080 b
Owyhee Russet	39.4 ab	28.1 a†	10.1 a†	1.093 a†
Clearwater Russet*	11.2 c	7.3 c	6.2 b	1.092 ab
Coaldale 1	23.9 ab	21.5 ab	8.5 ab	1.090 ab
Coaldale 3	22.3 abc	20.7 ab	8.7 ab	1.094 a
Coaldale 6	21.2 abc	15.2 bc	8.2 ab	1.085 ab
Coaldale 7	19.2 abc	13.7 bc	8.2 ab	1.085 ab
Coaldale 8	23.7 ab	20.8 ab	9.6 a	1.086 ab
LW008	29.0 ab	21.2 ab	7.2 ab	1.085 ab
Reduced N				
Russet Burbank	22.3 ab	13.7 ab	6.3 a	1.088 ab
Ranger Russet	20.8 ab	13.9 ab†	7.0 a	1.096 ab
Alpine Russet	21.0 ab†	15.3 ab†	6.5 a	1.103 a†
Blazer Russet	23.1 a	19.0 a	8.4 a	1.085 b
Owyhee Russet	27.2 a	21.3 a†	7.6 a†	1.099 ab†
Clearwater Russet*	11.22 b	5.4 b	6.4 a	1.099 ab
LW008	24.5 a	15.1 ab	7.3 a	1.086 b

*Seed lot was affected by herbicide carryover.
†Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

All of the varieties evaluated at the regular rate of N fell in a desirable range for specific gravity, between 1.085 and 1.095 except for Blazer Russet which measured 1.080. On reduced N, the specific gravity of all varieties tended to be higher than on regular N. The highest specific gravity was measured for Alpine Russet samples at 1.103. Blazer Russet and LW008 fell in the desirable range, but the specific gravity of all other varieties was higher than desirable at this level of N.

For the varieties evaluated in this trial, the reduced rate of N resulted in significantly lower total and marketable yield for Alpine Russet and significantly lower marketable yield for Ranger Russet and Owyhee Russet compared to the full rate of N. The reduced rate of N also resulted in

significantly smaller mean tuber size for Owyhee Russet. Specific gravity was significantly higher in Alpine Russet and Owyhee Russet grown on reduced N compared to full N.

The trial was designed to provide regional data for a wide range of potato cultivars. The N rate in the reduced N plots was approximately 100 lbs./ac lower than the regular rate. A rate of N that is intermediate may give better results than either full or reduced N, but this data may provide insight as to the response of each variety to different levels of N. Addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

The mean percentage of total tuber number in each weight category is shown in Table 38. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Coaldale 1 produced the greatest percentage of tubers over 4 oz. when grown on regular N, but not statistically different from Coaldale 8, Coaldale 3, LW008, Russet Burbank, Ranger Russet, Blazer Russet or Owyhee Russet. The greatest deformities were observed for Coaldale 6, Coaldale 7, Blazer Russet, Russet Burbank and Ranger Russet, while Coaldale 3 exhibited the lowest percentage of deformities.

Although no significant differences were noted in the yield of marketable tubers of each variety between the full and reduced rate of N, there were shifts within size categories. The percentage of small tubers increased significantly when Owyhee Russet was grown on reduced N compared to the full rate of N. There was a decrease in the percentage of 4 to 6 oz. tubers for LW008 and in 6 to 10 oz. tubers for Ranger Russet and Alpine Russet when these varieties were grown at a reduced rate of N. Reducing the N rate resulted in a significantly lower percentage of tubers over 10 oz. for Russet Burbank, Blazer Russet and Owyhee Russet.

Table 38: Percentage of total tuber number in each weight category (< 4oz., 4 to 6 oz., 6 to 10 oz. > 10 oz., and deformed) for each variety grown at full nitrogen (approximately 248 lbs./ac) and reduced nitrogen (approximately 150 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2012	< 4oz.	4 to 6 oz.	6 to 10 oz.	> 10 oz.	Deformed	> 4 oz.
Regular N						
Russet Burbank	17.7 bc	21.2 ab	31.0 a	21.8 ab†	8.3 ab	73.9 a-d
Ranger Russet	18.0 bc	18.7 ab	34.5 a†	23.9 ab	5.0 ab	77.0 a-d
Alpine Russet	15.3 bc	18.7 ab	30.2 a†	33.2 ab	2.6 b	82.1 abc
Blazer Russet	8.1 c	19.4 ab	26.8 a	39.3 a†	6.5 ab	85.4 ab
Owyhee Russet	8.2 c†	16.0 ab	30.4 a	40.5 a†	4.9 b	86.9 a
Clearwater Russet*	37.4 a	28.6 a	21.8 a	12.1 b	0.0 b	62.6 d
Coaldale 1	10.1 c	15.1 ab	35.4 a	37.9 a	1.5 b	88.5 a
Coaldale 3	16.8 bc	19.3 ab	35.3 a	27.9 ab	0.7 b	82.5 abc
Coaldale 6	12.7 bc	11.8 b	25.5 a	29.7 ab	20.4 a	67.0 cd
Coaldale 7	19.4 bc	17.5 ab	26.9 a	25.5 ab	10.7 ab	69.9 bcd
Coaldale 8	9.2 c	13.9 ab	34.5 a	39.8 a	2.6 b	88.2 a
LW008	23.6 b	21.2 ab†	31.7 a	20.0 ab	3.5 b	72.9 a-d
Reduced N						
Russet Burbank	34.6 ab	24.7 a	22.5 a	9.2 b†	9.0 ab	56.4 ab
Ranger Russet	28.3 ab	22.8 a	28.7 a†	14.7 ab	5.4 abc	66.2 ab
Alpine Russet	24.0 b	24.2 a	25.1 a†	22.6 ab	4.1 abc	71.9 ab
Blazer Russet	14.8 b	17.8 a	27.6 a	29.0 a†	10.7 a	74.5 ab
Owyhee Russet	18.2 b†	21.0 a	33.0 a	24.7 ab†	3.1 bc	78.7 a
Clearwater Russet*	52.2 a	24.2 a	16.4 a	6.7 b	0.6 c	47.2 b
LW008	32.8 ab	19.6 a†	22.8 a	18.6 ab	6.1 abc	61.0 ab

†Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 39. Owyhee Russet gave the greatest yield of 6 to 10 oz. potatoes at both levels of N, but was not statistically different from the other varieties. On full N, Owyhee Russet also gave the greatest yield over 10 oz. which was only significantly different from Coaldale 7 and Clearwater Russet. On reduced N, Blazer Russet produced the greatest yield of tubers over 10 oz.

Yields of tubers over 10 oz. for Russet Burbank and Blazer Russet were significantly affected by the level of N, while yield in other categories was not significantly affected. Yield of 6 to 10 oz. tubers of Ranger Russet and Alpine Russet were significantly affected by the rate of N. A significantly lower yield of 4 to 6 oz. tubers was produced by LW008 grown at the reduced rate of N and a significantly greater yield of tubers less than 4 oz. was produced when Owhyee Russet was grown at the reduced rate of N.

Table 39: Estimated yield (ton/ac) in each weight category (< 4oz., 4 to 6 oz., 6 to 10 oz. > 10 oz., and deformed) for each variety grown at full nitrogen (approximately 248 lbs./ac) and reduced nitrogen (approximately 150 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2012	< 4oz.	4 to 6 oz.	6 to 10 oz.	> 10 oz.	Deformed
Regular N					
Russet Burbank	5.3 ab	6.4	9.5 a	6.7 abcd†	2.5 ab
Ranger Russet	4.8 abc	5.1	9.3 a†	6.7 abcd	1.4 ab
Alpine Russet	4.1 abc	5.0	8.3 ab†	9.3 abc	0.8 b
Blazer Russet	2.5 c	6.8	8.4 ab	12.6 ab†	2.0 ab
Owyhee Russet	2.6 bc†	5.0	9.9 a	13.2 a	1.8 ab
Clearwater Russet*	4.0 abc	3.2	2.6 b	1.5 d	0.0 b
Coaldale 1	2.4 c	3.7	8.6 ab	9.2 abc	0.4 b
Coaldale 3	4.2 abc	4.9	8.9 a	6.9 abcd	0.2 b
Coaldale 6	2.8 bc	2.6	5.9 ab	6.6 abcd	4.4 a
Coaldale 7	3.6 bc	3.5	5.9 ab	5.0 cd	1.9 ab
Coaldale 8	2.2 c	3.5	8.3 ab	9.0 abc	0.6 b
LW008	6.6 a	6.0†	9.2 a	6.0 abcd	1.0 b
Reduced N					
Russet Burbank	6.0 ab	5.5	6.0 ab	2.3 ab†	1.5 ab
Ranger Russet	5.6 ab	4.5	6.0 ab†	3.3 ab	1.1 ab
Alpine Russet	4.8 b	5.1	5.3 ab†	4.9 ab	0.8 b
Blazer Russet	3.5 b	4.3	7.2 ab	7.5 a	2.8 a
Owyhee Russet	4.7 b†	5.5	9.1 a	6.7 a†	0.9 b
Clearwater Russet*	5.7 ab	2.7	1.9 a	0.8 b	0.1 b
LW008	7.7 a	4.6†	5.7 ab	4.7 ab	1.5 ab

†Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

Fry scores are presented in Table 40. The Coaldale varieties and the LW varieties were evaluated by the sponsor and data is not available for this report. Fries made from LW008 grown at both levels of N were lighter than those made from Russet Burbank. At the full N rate, Ranger Russet, Blazer Russet and Owyhee Russet were slightly darker than Russet Burbank fries. On reduced N, Owyhee Russet fried as well as Russet Burbank and all other varieties fried lighter. All varieties tested had a mealy texture suitable for French fries. The most uniform fry colour was observed for Alpine Russet and LW008 when grown on reduced N.

Table 40: Fry scores: Fry Colour was assessed visually by comparison with a USDA fry colour chart (000 to 4; the lower the score, the better the fry colour). Data shown is the result of one composite sample run in duplicate.

2012

Regular N	Fry Colour	Internal Texture[1]	Colour Uniformity[2]
Russet Burbank	USDA 0	4	2
Ranger Russet	USDA 1	4	2
Alpine Russet	USDA 0	4	3
Blazer Russet	USDA 1	4	2
Owyhee Russet	USDA 2	4	2
Clearwater Russet	USDA 0	4	3
LW008	USDA 00	4	3
Reduced N			
Russet Burbank	USDA 1	4	2
Ranger Russet	USDA 0	4	3
Alpine Russet	USDA 00	4	5
Blazer Russet	USDA 0	4	3
Owyhee Russet	USDA 1	4	3
Clearwater Russet	USDA 0	4	3
LW008	USDA 00	4	5

[1] Internal texture: 1 (wet) - 4 (mealy)
[2] Color uniformity: 1 (very variable) - 5 (very uniform)

Tuber samples used to measure specific gravity were evaluated for hollow heart, brown centre, stem-end discoloration, other types of internal necrosis and scab. There were very few internal defects noted for the French fry varieties evaluated. Stem end discoloration was noted in several samples, possibly related to tuber maturity.

2013

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the full nitrogen rate (235 lbs/ac) was achieved through a combination of soil fertility (124 lbs./ac N; 361 lbs./ac P, 1930 lbs./ac K), broadcast fertilizer (165 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting and broadcast fertilizer (132 lbs./ac 34-0-0) incorporated at hilling. Fertility for the reduced nitrogen rate (190 lbs./ac) was achieved through a combination of soil fertility and broadcast fertilizer (165 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting. Varieties were planted in four replicate rows in a randomized split block design (with fertility as the main block) along with standard varieties (Russet Burbank and Shepody). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 6) to control weeds. Seed of standard cultivars was provided by Edmonton Potato Growers and seed of test cultivars was provided by each participant. Seed was cut (70 to 85 g) and suberized prior to planting. Potatoes were planted May 23, 2013 approximately 5 to 5½"deep using a two-row tuber unit planter. Seed was planted at 30cm spacing in 6m rows spaced 90cm apart.

The potatoes were hilled June 17 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 41). Insecticide was applied July 10 (Matador 120 EC, 40 mL/ac) to control Colorado potato beetle.

Table 41: Foliar fungicides applied to the potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
July 10	Quadris	202 mL/ac
July 20	Bravo 500	0.64 L/ac
Aug 15	Ridomil Gold Bravo	883 mL/ac

Figure 25: Variety evaluation trial at CDCS in Brooks, AB July 30, 2013.

Reglone (1.4 L/ac) was applied September 11 to facilitate mechanical harvest. Tubers were harvested September 23-24 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 8˚C until graded. Tubers were graded into weight categories (less than 4 oz., 4 – 6 oz., 6 – 10 oz., over 10 oz. and deformed). A sample of twenty-five tubers (over 6 oz.) from each replicate was used to determine specific gravity using the weight in air over weight in water method. The length and diameter of each tuber in the specific gravity sample was recorded and the tubers were cut longitudinally to assess internal defects. Sub-samples were provided to customers for storage evaluation as requested.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request.

Results and Discussion

Sample hills of each variety were dug for a field day August 22, 2013. Photos of these varieties are shown in Figure 25.

Figure 25. French fry varieties at the CDCS field day August 22, 2013: a) Russet Burbank, b) LW 004, and c) Shepody.

Yield data (total yield and marketable yield; ton/ac), mean marketable tuber weight (oz.) and specific gravities of each of the varieties are shown in Table 42. The highest total yield was observed for Russet Burbank on regular N, although total yield of LW 004 and Shepody were not statistically less than Russet Burbank at either level of N. The greatest marketable yield and mean tuber weight was observed for Shepody on reduced N, but Shepody is not normally harvested in late September.

No significant differences in total yield or yield of individual size categories were noted for the varieties when the results of Regular N and Reduced N plots were compared. However, Shepody on reduced N plots had significantly greater mean tuber weight than when grown on regular N and Russet Burbank grown on regular N had significantly greater marketable yield than Russet Burbank grown on reduced N.

Table 42: Estimated total yield and marketable yield (ton/acre), mean weight of marketable tubers, tuber length to width (L/W) ratio and specific gravity for each variety grown at full nitrogen (approximately 240 lbs./ac) and reduced nitrogen (approximately 190 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2013 French Fry	Yield (ton/ac)	Yield over 4 oz. (ton/ac)	Mean Tuber weight (oz.)	SG
Regular N Fertility				
Russet Burbank	33.62 a	29.65 a†	9.02 a	1.081 a
LW 004	29.32 a	28.31 a	9.18 a	1.085 a
Shepody	29.41 a	28.25 a	9.27 a†	1.082 a
Reduced N				
Russet Burbank	31.73 a	26.71 b†	9.06 b	1.082 a
LW 004	27.36 a	26.55 b	9.17 b	1.082 a
Shepody	31.67 a	31.14 a	11.10 a†	1.082 a

†Data between the regular and reduced N plots was statistically different at the $p \leq 0.05$ level.

There were no significant differences in specific gravity for any of the varieties at either level of N.

The mean percentage of total tuber yield in each weight category is shown in Table 43. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

Table 43: Percentage of total tuber yield in each weight category (< 4oz., 4 to 6 oz., 6 to 10 oz. > 10 oz., and deformed) for each variety grown at full nitrogen (approximately 240 lbs./ac) and reduced nitrogen (approximately 190 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2013	< 4oz.	4 to 6 oz.	6 to 10 oz.	> 10 oz.	Deformed
Regular N					
Russet Burbank	9.0 a	13.75 a	27.25 a	42.0 ab	8.0 a
LW 004	8.75 a	16.25 a	37.75 a	36.0 b	1.3 b
Shepody	5.75 a	11.25 a†	31.25 a	49.75 a†	2.0 b
Reduced N					
Russet Burbank	11.25 a	14.25 a	25.5 a	34.5 c	14.5 a
LW 004	5.25 b	12.0 ab	33.75 a	46.8 b	1.5 b
Shepody	6.0 ab	7.0 b†	25.0 a	60.0 a†	1.3 b

†Data between the regular and reduced N plots was statistically different at the $p \leq 0.05$ level.

There were no significant differences in the percentage of tubers in the under 4 oz., the 4 to 6 oz. or the 6 to 10 oz. categories when the varieties were grown on 240 lbs./ac N. At this level of N, Shepody produced a significantly higher percentage of tubers over 10 oz. relative to LW 004. At 190 lbs./ac N, Russet Burbank produced a significantly higher percentage of tubers under 4 oz. and 4 to 6 oz. and correspondingly lower percentage of tubers over 10 oz. than the other two varieties. LW 004 was not statistically different from Shepody except that Shepody produced a greater percentage of tubers over 10 oz. at the 190 lb./ac rate. Russet Burbank produced a significantly higher percentage of deformed tubers than Shepody or LW 004 at both rates of N. The size distribution for Shepody changed significantly with N rate. When grown at a moderate rate of N, Shepody tends to produce a higher percentage of larger tubers. This type of shift was not statistically significant for Russet Burbank or LW 004.

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 44. There were few statistical differences between varieties in specific size categories when grown at 240 lbs./ac N. Shepody produced significantly less undersized potatoes than the other two varieties and Russet Burbank produced significantly more deformed tubers. In the 190 lb./ac N plots, the size profile of Russet Burbank shifted toward smaller tubers, while the size profile of Shepody shifted toward larger tubers. LW 004 produced significantly fewer undersized and deformed tubers than Russet Burbank. There were no significant differences in any specific size category resulting from different levels of N.

Table 44: Estimated yield (ton/ac) in each weight category (< 4oz., 4 to 6 oz., 6 to 10 oz. > 10 oz., and deformed) for each variety grown at full nitrogen (approximately 240 lbs./ac) and reduced nitrogen (approximately 190 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2013	< 4oz.	4 to 6 oz.	6 to 10 oz.	> 10 oz.	Deformed
Regular N					
Russet Burbank	2.87 a	4.41 a	8.79 a	13.58 a	2.73 a
LW 004	2.54 a	4.62 a	10.76 a	10.38 a	0.39 b
Shepody	1.62 b	3.23 a	9.01 a	14.39 a	0.54 b
Reduced N					
Russet Burbank	3.39 a	4.33 b	7.87 a	11.12 b	4.89 a
LW 004	1.50 b	3.26 ab	9.11 a	12.68 b	0.43 b
Shepody	1.88 b	2.20 a	7.93 a	19.13 a	0.48 b

†Data between the regular and reduced N plots was statistically different at the $p \leq 0.05$ level.

Fry scores are presented in Table 45.

Table 45: Fry scores. Fry Colour was assessed visually by comparison with a USDA fry colour chart (000 to 4; the lower the score, the better the fry colour). Data shown is the result of one composite sample run in duplicate.

2013

Regular N	Fry Colour	Internal Texture[1]	Colour Uniformity[2]
Russet Burbank	1	3.0	4.0
Ivory Russet	0	4.0	4.0
Shepody	1	3.0	3.0
Reduced N			
Russet Burbank	1	3.0	3.0
Ivory Russet	0	4.0	3.0
Shepody	2	4.0	3.0

[1] Internal texture: 1 (wet) - 4 (mealy)
[2] Color uniformity: 1 (very variable) - 5 (very uniform)

Tuber samples used to measure specific gravity were evaluated for hollow heart, brown centre, stem-end discoloration, other types of internal necrosis and scab. There were few internal defects noted for LW 004 or russet Burbank grown on 240 lbs./ac N. Shepody tubers had some incidence of stem end discoloration at this level of N. At the lower level of N, very few internal defects were noted in any of the varieties.

Conclusions

Each year of the trial included a number of French fry potato varieties with potential in southern Alberta. In 2011, Russet Burbank was included in the trial as a check variety, but seed piece decay affected the stand and yield. The use of mini-tubers for some of the varieties did not allow for a fair comparison of those varieties with the check and additional work with these varieties would be beneficial. In 2012, Russet Burbank, Ranger Russet and Shepody were included in the trial as check varieties. In 2013, Russet Burbank and Shepody were included in the trial as check varieties. Yield of several new varieties compared well with Russet Burbank. The specific gravities of most of the varieties fell within a desirable range.

The trial was designed to provide regional data for new potato cultivars and to give some idea of the nitrogen rate required to produce yields comparable to standard varieties. In 2011, the N rate in the low N plots was over 100 lbs./ac lower than the regular rate and may have been too low. A rate of N that is intermediate may give better results than either full or low N. In 2013, marketable yield of Russet Burbank (over 4 oz.) was greater on the higher fertility treatment. Mean tuber size for Shepody was greater on the reduced fertility treatment. Addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

Chipping Variety Evaluation

2011

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the full nitrogen rate was achieved through a combination of soil fertility (105 lbs./ac N; 214 lbs./ac P, 720 lbs./ac K), and broadcast fertilizer (350 lbs./ac of 34-17-0) incorporated at hilling. Fertility for the low nitrogen rate was achieved through a combination of soil fertility and broadcast fertilizer (100 lbs./ac of 11-52-0) incorporated at hilling. Varieties were planted in four replicate rows in a randomized split block design (with fertility as the main block) along with two standard varieties (Atlantic and Lady Claire). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 13) to control weeds. Seed of standard cultivars was provided by Old Dutch Foods and seed of test cultivars was provided each participant. Potatoes were planted May 30, 2011 approximately 5 to 5½"deep using a two-row tuber unit planter. Seed was planted at 30cm spacing in 6m rows spaced 90cm apart. Seed was planted as single drop with the exception of some of the larger varieties. Cut seed (70 to 85 g) was suberized prior to planting.

The potatoes were hilled June 8 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 46). Insecticide was applied July 17 (Decis 5 EC, 50 mL/ac) to control Colorado potato beetle.

Table 46: Foliar fungicides applied to the potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
July 18	Bravo 500	0.64 L/ac
Aug 2	Bravo 500	0.64 L/ac
Aug 23	Dithane DG Rainshield	0.91 kg/ac

Figure 26: Variety evaluation trial at CDCS in Brooks, AB July 22, 2011.

Samples were taken from one replicate row of each variety to determine sugar concentrations prior to harvest. The yield and grade of these samples were recorded and added back to harvest data. Reglone (1.4 L/ac) was applied September 6 and re-applied (1.0 L/ac) September 12 to facilitate mechanical harvest. Tubers were harvested September 21 – 26 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 10˚C until graded. Tubers were graded into size categories (less than 48mm, 48 – 88mm, and over 88mm). A sample of twenty-five tubers (48 – 88mm) from each replicate was used to determine specific gravity using the weight in air over weight in water method. These tubers were cut longitudinally to assess internal defects. Two composite samples of 8 tubers each (2 per rep) were stored at 15˚C until culinary analyses could be performed. Sugar concentrations were measured November 23 – 25 and samples were evaluated for chip color Nov 29.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request.

Results and Discussion

Sample hills of each variety were dug for a field day August 24, 2011. Photos of these varieties are shown in Figure 20.

Figure 27. Chipping varieties at the CDCS field day August 24, 2011: a) Atlantic, b) PLP 001, c) ODF 001, d) Sentinel, e) RV 001, f) ODF 002, g) Lady Claire, h) Lady Valora, i) ODF 004, j) EPG 001, and k) ODF 003.

Yield data (total yield; ton/ac) and specific gravities of each of the releases are shown in Table 47. The highest total yield was observed with EPG 001 on regular N, and Lady Claire, Lady Valora, ODF 001, ODF 002 and Sentinel were not statistically less than EPG 001. The highest total yield on low N was observed with Lady Valora and Atlantic, Lady Claire, ODF 001, ODF

002, ODF 003, ODF 004 and Sentinel were not statistically different. For all varieties except Atlantic, total yield was higher in the regular N plots than in the low N plots.

Table 47: Estimated total yield (ton/acre) and specific gravity for each variety grown at full nitrogen (approximately 225 lbs./ac) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2011 Chippers	Yield (ton/ac)	SG
Regular Fertility		
Atlantic	19.65 c	1.089 ab
EPG 001	34.40 a	1.079 b
Lady Claire	32.56 ab	1.088 ab
PLP 001	24.61 bc	1.098 ab
Lady Valora	26.64 abc	1.092 ab
ODF 001	26.02 abc	1.081 b
ODF 002	27.73 abc	1.100 a
ODF 003	23.24 c	1.090 ab
ODF 004	23.78 bc	1.080 b
RV 001	22.41 c	1.099 ab
Sentinel	27.92 abc	1.080 b
Low Fertility		
Atlantic	20.26 pq	1.091 pq
Lady Claire	22.08 p	1.094 p
PLP 001	17.40 q	1.096 p
Lady Valora	24.71 p	1.095 p
ODF 001	18.39 pq	1.082 r
ODF 002	23.40 pq	1.098 p
ODF 003	21.13 pq	1.093 pq
ODF 004	21.62 p	1.083 qr
RV 001	17.23 q	1.102 p
Sentinel	22.10 pq	1.083 r

ODF 002 had the highest specific gravity on regular N, but this was not statistically different from RV 001, PLP 001, Lady Valora, ODF 003, Atlantic and Lady Claire. The lowest specific gravity was observed with EPG 001, ODF 004 and Sentinel at regular N. The specific gravities of chipping varieties tended to be lower on regular N plots than low N plots, as expected.

The trial was designed to provide regional data for a wide range of potato cultivars. The N rate in the low N plots was over 100 lbs./ac lower than the regular rate. A rate of N that is intermediate may give better results than either full or low N. Addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

The mean percentage of total tuber number in each size category is shown in Table 48. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

In the regular N plots, PLP 001 produced the greatest percentage of potatoes in the small (<48mm) category, although not statistically different from Lady Claire, Lady Valora, ODF 001, ODF 002, ODF 003, ODF 004 and RV 001. Sentinel produced the greatest percentage of tubers in the medium (48-88mm) category and Atlantic, EPG 001, ODF 001, ODF 002, ODF 003 and ODF 004 were not statistically different. There were no statistically significant differences in the large (> 88mm) or deformed size categories.

In the low N plots, PLP 001 produced a significantly greater percentage of small tubers (< 48mm) than other varieties, while Atlantic, ODF 001, ODF 003 and Sentinel produced a significantly lower percentage of small tubers. Sentinel produced the greatest percentage of medium tubers (48 – 88mm) and Atlantic, ODF 001 and ODF 003 were not statistically different. There were no statistically significant differences in the large (> 88mm) or deformed size categories from the low N plots. Fewer large tubers were observed from the low N plots than from the regular N plots.

Table 48: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each variety grown at full nitrogen (approximately 225 lbs./ac) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2011	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Regular N				
Atlantic	16.7 b	71.9 abc	10.8	1.5
EPG 001	14.6 b	75.6 ab	9.8	0
Lady Claire	37.6 ab	61.9 bc	0.1	1.1
PLP 001	62.3 a	37.1 d	0	1.1
Lady Valora	40.9 ab	58.9 c	0	0.8
ODF 001	24.1 ab	73.1 abc	2.7	0.7
ODF 002	32.7 ab	67.1 abc	0.1	0.3
ODF 003	20.8 ab	75.8 a	3.4	0.2
ODF 004	31.2 ab	67.9 abc	0.8	0.4
RV 001	47.2 ab	51.9 cd	0	2.2
Sentinel	13.6 bc	80.6 a	5.8	0
Low N				
Atlantic	19.3 r	79.6 p	1.1	0.6
Lady Claire	44.2 q	55.7 q	0.1	0.7
PLP 001	66.1 p	33.9 r	0	0.5
Lady Valora	46.5 q	53.5 q	0	0.2
ODF 001	18.4 r	81.0 p	0.6	0.2
ODF 002	37.6 q	62.4 q	0	0.3
ODF 003	21.7 r	77.1 p	1.2	0.2
ODF 004	39.0 q	60.4 q	0.6	0.1
RV 001	48.7 q	51.3 q	0	0.2
Sentinel	15.7 r	81.0 p	3.4	0.2

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 49. In the regular N plots, PLP 001 produced significantly greater yield of small (< 48mm) potatoes while Atlantic, EPG 001, ODF 001, ODF 003, ODF 004 and Sentinel produced the lowest yield of smalls. EPG 001 gave the greatest yield of medium (48 – 88mm) potatoes but was not statistically different from Lady Claire, Lady Valora, ODF 001, ODF 002, ODF 003, ODF 004 and Sentinel. EPG 001 also resulted in the greatest yield of large (> 88mm) potatoes, which was statistically different from varieties that produced no large potatoes (PLP 001, Lady Valora, and RV 001. There were no statistically significant differences in the deformed size categories from regular N plots.

In the low N plots, PLP 001 produced the greatest yield of small (< 48mm) potatoes, but not statistically more than Lady Claire, Lady Valora and RV 001. The greatest yield of medium (48 – 88mm) potatoes was observed with Sentinel but Atlantic, Lady Claire, Lady Valora, ODF 001, ODF 002, ODF 003 and ODF 004 were not statistically different. For all varieties except Atlantic, yield of medium (48 – 88mm) tubers was higher in the regular N plots than in the low N plots.

Table 49: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each variety grown at full nitrogen (approximately 225 lbs./ac) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2011	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Regular N				
Atlantic	1.07 d	13.60 c	5.74 ab	0.29
EPG 001	1.74 d	25.88 a	8.18 a	0.03
Lady Claire	7.04 b	24.46 a	0.08 ab	1.21
PLP 001	9.83 a	14.05 c	0 b	0.89
Lady Valora	6.13 bc	20.17 abc	0 b	0.41
ODF 001	2.43 d	21.45 abc	2.21 ab	0.38
ODF 002	5.10 bc	22.39 ab	0.10 ab	0.23
ODF 003	2.03 d	19.11 abc	2.53 ab	0.03
ODF 004	3.64 cd	19.29 abc	0.84 ab	0.20
RV 001	6.17 bc	15.03 bc	0 b	1.46
Sentinel	1.55 d	22.87 ab	4.24 ab	0
Low N				
Atlantic	1.95 r	17.53 p	0.73	0.23
Lady Claire	5.92 pq	15.69 pqr	0.16	0.41
PLP 001	8.06 p	9.13 r	0	0.25
Lady Valora	6.55 pq	17.32 p	0	1.01
ODF 001	1.47 r	16.57 pq	0.35	0.08
ODF 002	5.11 q	18.16 p	0	0.15
ODF 003	2.20 r	18.31 p	0.70	0.05
ODF 004	4.43 qr	16.77 pq	0.46	0.05
RV 001	6.36 pq	10.37 qr	2.08	0.60
Sentinel	1.36 r	18.96 p	0	0.08

A comparison of medium potatoes (48 – 88mm) for each variety from regular and low fertility plots is shown in Figure 28.

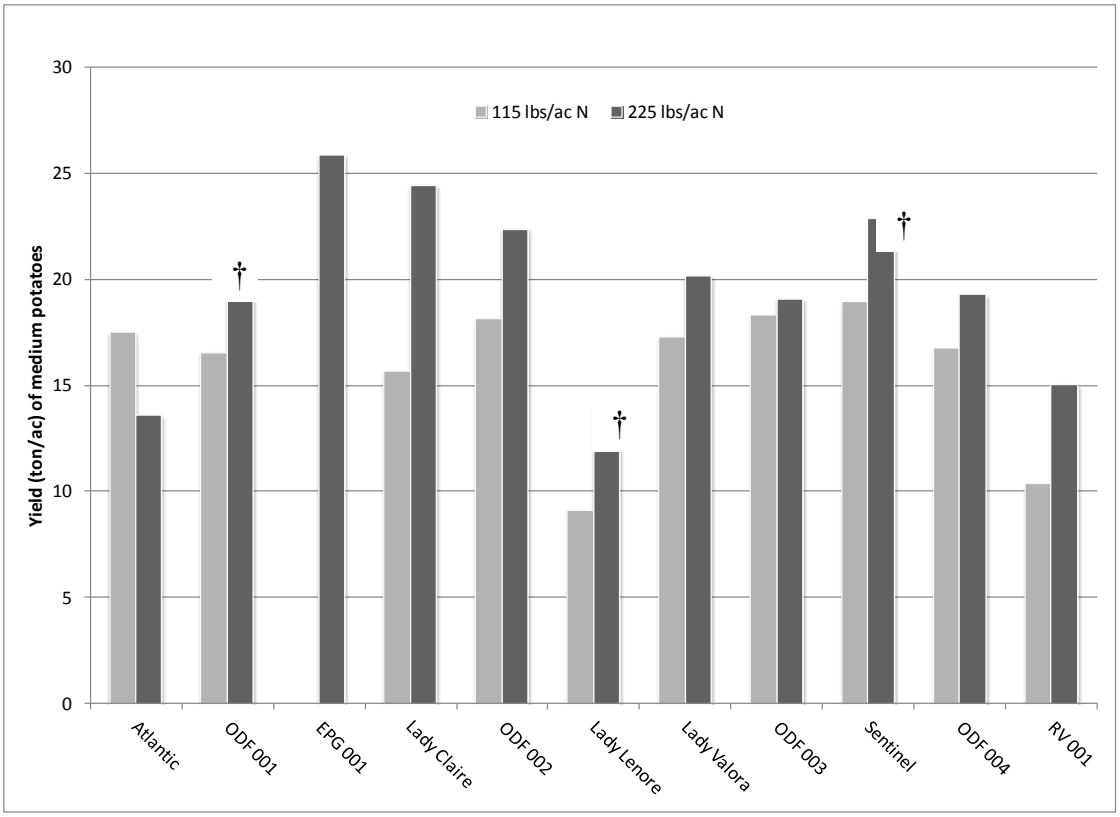

Figure 28: Yield of potatoes (48 – 88mm) produced on low (115 lbs./ac) and regular (225 lbs./ac) N. For each variety, columns marked with † are statistically different ($p \leq 0.05$).

Chip colour scores of composite samples are presented in Table 50. All of the samples except Atlantic grown at 225 lbs./ac N gave good chip scores. RV 001 and Lady Claire grown in the regular N plots gave the lightest chip scores.

Table 50: Chip colour scores from subsamples of each variety grown at full nitrogen (approximately 225 lbs./ac) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of duplicate analyses of a composite sample evaluated on a Hunter Colorimeter (L is a lightness score; higher numbers are lighter).

2011	L		L
Regular N		Low N	
Atlantic	56.57	Atlantic	61.47
EPG 001	62.69		
Lady Claire	68.81	Lady Claire	67.65
PLP 001	65.05	PLP 001	67.96
Lady Valora	64.16	Lady Valora	61.93
RV 001	71.89	RV 001	66.74
Sentinel	60.17	Sentinel	61.62

Tuber samples used to measure specific gravity were evaluated for hollow heart, brown centre, stem-end discoloration, other types of internal necrosis and scab. There were very few internal defects observed in the tubers examined. Hollow heart was noted in a few tubers of the Atlantic, EPG 001, ODF 002, and ODF 003. Subsamples of ODF 001, Lady Claire, Lady Valora, and RV 001 were free of any internal defects.

Approximately 16% of PLP 001 tubers showed common scab lesions of up to 8% tuber coverage.

2012

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the full nitrogen rate (248 lbs/ac) was achieved through a combination of soil fertility (82 lbs./ac N; 192 lbs./ac P, 760 lbs./ac K), broadcast fertilizer (176 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting and broadcast fertilizer (279 lbs./ac 34-0-0) incorporated at hilling. Fertility for the medium nitrogen rate (150 lbs./ac) was achieved through a combination of soil fertility and broadcast fertilizer (176 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting. Fertility for the low nitrogen rate (90 lbs./ac) was achieved through a combination of soil fertility and broadcast fertilizer (100 lbs./ac of 11-52-0) incorporated prior to planting. Varieties were planted in four replicate rows in a randomized split block design (with fertility as the main block) along with standard varieties (Atlantic, Niska and PLP 001). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 10) to control weeds. Seed of standard cultivars was provided by Edmonton Potato Growers and seed of test cultivars was provided by each participant. Most varieties were planted May 23, 2012 approximately 5 to 5½"deep using a two-row tuber unit planter. Seed was planted at 30cm spacing in 6m rows spaced 90cm apart. Seed was cut (70 to 85 g) and suberized prior to planting.

The potatoes were hilled June 4 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 51). Insecticide was applied July 17 (Matador 120 EC, 40 mL/ac) and August 15 (Decis 5 EC, 50 mL/ac) to control Colorado potato beetle.

Table 51: Foliar fungicides applied to the potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
June 29	Bravo 500	0.64 L/ac
July 27	Ridomil Gold Bravo	883 mL/ac
Aug 15	Bravo 500	0.64 L/ac

Figure 29: Variety evaluation trial at CDCS in Brooks, AB July 20, 2012.

Reglone (1.4 L/ac) was applied September 13 to facilitate mechanical harvest. Tubers were harvested September 18-25 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 10˚C until graded. Tubers were graded into size categories (less than 48mm, 48 – 88mm, and over 88mm). A sample of twenty-five tubers (48 – 88mm) from each replicate was used to determine specific gravity using the weight in air over weight in water method. These tubers were cut longitudinally to assess internal defects. A composite sample of 8 tubers (2 per rep) was stored at 10˚C until culinary analyses were performed. Samples were evaluated for chip color using a Hunter Colorimeter December 17, 2012.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request. Comparisons for specific cultivars at two rates of N were analyzed using t-tests on a cultivar-by-cultivar basis (Excel; $p \leq 0.05$).

Results and Discussion

Sample hills of each variety were dug for a field day August 22, 2013. Photos of these varieties are shown in Figure 30.

Figure 30. Chipping varieties at the CDCS field day August 22, 2012: a) Atlantic, b) Niska, c) Lady Claire, d) ODF 003, e) EPG 005, f) EPG 006, g) PLP 001, h) ODF 005, i) RV 002, j) RV 003 and l) RV 004.

Yield data (total yield; ton/ac) and specific gravities of each of the cultivars are shown in Table 52. At the regular rate of N (248 lbs./ac), RV 002 produced the highest total yield, but significantly more than EPG 005 and EPG 006 which were planted late. At a moderate rate of N (150 lbs./ac), the highest yield was observed with ODF 005, but was not statistically different from most other cultivars. For each cultivar, a t-test was applied to determine whether total yield was significantly affected by the rate of N in the plots. Although there was a trend toward lower yield on reduced N plots, no statistically significant differences were identified for total yield.

Table 52: Estimated total yield (ton/acre) and specific gravity for each variety grown at full nitrogen (approximately 248 lbs./ac), moderate nitrogen (approximately 150 lbs./ac) and low N (100 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2012 Chippers	Yield (ton/ac)	SG
Regular N		
Atlantic	29.5 ab	1.113 a
Lady Claire	20.5 c	1.128 a
PLP 001	30.8 a	1.118 a
Niska	30.2 a	1.102 a
RV 002	32.5 a	1.106 a
RV 003	29.7 ab	1.111 a
RV 004	27.0 abc	1.117 a
ODF 003	21.7 bc	1.117 a
EPG 005	9.5 d	1.109 a
EPG 006	11.2 d	1.108 a†
Moderate N		
Atlantic	22.6 ab	1.115 a
Lady Claire	20.3 ab	1.111 abc
PLP 001	26.3 a	1.114 ab
Niska	25.1 ab	1.096 cd
RV 002	26.7 a	1.098 bcd
ODF 005	29.2 a	1.099 abcd
RV 003	22.1 ab	1.107 abc
RV 004	24.1 ab	1.102 abcd
ODF 003	18.3 ab	1.100 abcd
EPG 005	7.9 b	1.090 d
EPG 006	7.9 b	1.094 cd†
Low N		
Atlantic	16.8	1.109
ODF 005	20.0	1.091

† Data between the regular and moderate N plots was statistically different at the $p \leq 0.05$ level.

Potatoes selected as chipping cultivars, typically have specific gravities above 1.080 in Alberta and all of the entries in this trial were well above this level of solids. Specific gravity measurements for these cultivars seemed abnormally high and may reflect a technical error. The numbers may be somewhat useful in relative terms, but should not be relied on as absolute values. The chipping scores (Table 56) will provide a better indication of suitability for chipping.

The trial was designed to provide regional data for a wide range of potato cultivars. The N rate in the moderate N plots was approximately 100 lbs./ac lower than the regular rate. The rate of N may have been too different to establish the best rate for each cultivar. An intermediate rate may have resulted in greater yield than either of the rates tested.

The mean percentage of total tuber number in each size category is shown in Table 53. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

In the regular N plots, RV 004 produced the greatest percentage of marketable tubers and was not statistically different from Atlantic, Niska, RV 002, or ODF 003. In the moderate N plots, ODF 003 produced the greatest percentage of potatoes in the marketable category (48 – 88mm) and was not statistically different from Atlantic, Lady Claire, Niska, RV 002, ODF 005, RV 004 or EPG 006. Atlantic and ODF 005 both produced a high percentage of marketable tubers on low N. As expected, there was a shift in size profile when tubers were grown on different rates of N. For Atlantic, there were significantly more small and significantly fewer large tubers on moderate than on regular N. RV 004 produced significantly more small and significantly fewer marketable tubers on moderate N.

Table 53: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each variety grown at full nitrogen (approximately 248 lbs./ac), moderate nitrogen (approximately 150 lbs./ac) and low nitrogen (100 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2012	% <48mm	% 48 to 88mm	% > 88mm	% deformed
Regular N				
Atlantic	17.8 c†	73.4 a	6.4 a†	2.4 a
Lady Claire	49.1 a	49.6 b	0.1 c†	1.1 a
PLP 001	48.2 b	50.1 b	0.1 c	1.7 a
Niska	20.7 c	69.9 a	6.1 a	3.3 a
RV 002	31.8 c	66.3 a	0.6 bc	1.3 a
RV 003	53.9 b	44.3 b	0.0 c	1.9 a
RV 004	21.6 c†	74.1 a†	0.7 bc	3.6 a
ODF 003	23.7 c	70.4 a	5.0 ab	0.8 a
EPG 005	72.5 a	25.2 c	0.0 c	2.3 a
EPG 006	51.0 b	46.4 b	0.9 bc	1.7 a
Moderate N				
Atlantic	32.6 cd†	64.8 ab	2.2 a†	0.5 a
Lady Claire	49.9 abcd	48.9 abc	0.6 a†	0.7 a
PLP 001	61.4 abc	37.7 bcd	0.2 a	0.7 a
Niska	32.7 cd	62.5 ab	2.4 a	2.4 a
RV 002	44.1 bcd	55.6 abc	0.1 a	0.2 a
ODF 005	46.7 bcd	49.2 abc	3.3 a	0.7 a
RV 003	68.4 ab	31.1 cd	0.0 a	0.5 a
RV 004	31.8 cd†	63.6 ab†	0.3 a	4.3 a
ODF 003	28.8 d	66.7 a	3.6 a	0.9 a
EPG 005	78.1 a	20.1 d	0.0 a	1.8 a
EPG 006	47.3 bcd	50.0 abc	0.5 a	2.2 a
Low N				
Atlantic	25.2	70.0	4.0	0.8
ODF 005	33.3	64.5	1.9	0.3

† Data between the regular and moderate N plots was statistically different at the $p \leq 0.05$ level.

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 54. At the regular rate of N (248 lbs./ac), RV 002 produced the greatest yield of marketable tubers, although not statistically different from Atlantic, PLP 001, Niska, RV 003 and RV 004. On moderate N plots, RV 002 produced the greatest yield of marketable (48 – 88mm) tubers and only EPG 006 and EPG 005 were statistically different.

In general, moderate N resulted in lower marketable yield than regular N. For Atlantic and RV 004, significantly greater yield of small tubers were produced on moderate N plots than on regular N plots and correspondingly fewer large and marketable tubers were produced.

Table 54: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each variety grown at full nitrogen (approximately 248 lbs./ac), moderate nitrogen (approximately 150 lbs./ac) and low nitrogen (100 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2012	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Regular N				
Atlantic	1.5 f†	21.7 abc	4.9 a†	1.3 a
Lady Claire	5.7 bc	14.2 cd	0.2 d	0.4 a
PLP 001	7.8 ab	21.7 abc	0.1 d	1.2 a
Niska	2.0 ef	22.6 ab	4.4 ab	1.2 a
RV 002	4.4 cd	26.1 a	1.4 bcd	0.6 a
RV 003	10.2 a	18.2 abc	0.0 d	1.4 a
RV 004	2.1 def†	22.6 ab†	0.6 cd	1.7 a
ODF 003	1.9 f	16.0 bc	3.5 abc	0.4 a
EPG 005	4.4 cde	4.6 e	0.0 d	0.5 a
EPG 006	2.8 def	7.7 de†	0.4 cd	0.3 a
Moderate N				
Atlantic	2.8 cd†	18.0 a	1.7 a†	0.1 a
Lady Claire	5.6 bc	13.9 abc	0.5 a	0.3 a
PLP 001	10.0 a	15.6 ab	0.2 a	0.5 a
Niska	3.0 bcd	18.8 a	2.3 a	1.1 a
RV 002	6.3 b	20.1 a	0.1 a	0.2 a
ODF 005	4.4 bcd	14.6 abc	2.5 a	0.1 a
RV 003	10.9 a	10.9 abc	0.0 a	0.2 a
RV 004	3.4 bcd†	18.4 a†	0.2 a	2.1 a
ODF 003	2.0 d	14.0 abc	2.0 a	0.2 a
EPG 005	4.4 bcd	3.4 c	0.0 a	0.1 a
EPG 006	2.7 cd	4.8 bc†	0.1 a	0.3 a
Low N				
Atlantic	2.0	15.2	2.6	0.3
ODF 005	2.5	13.3	1.0	0.1

† Data between the regular and moderate N plots was statistically different at the $p \leq 0.05$ level.

A comparison of medium potatoes (48 – 88mm) for each variety from regular, moderate and low N plots is shown in Figure 31.

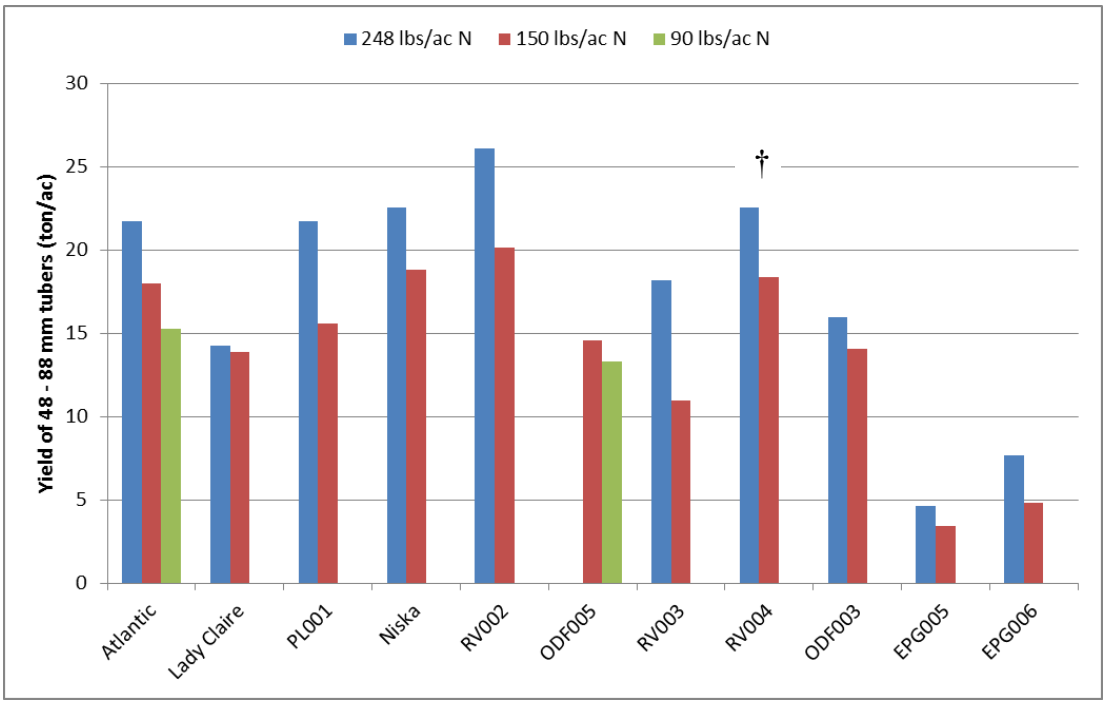

Figure 31: Yield (ton/ac) of potatoes (48 – 88mm) produced on regular (248 lbs./ac) N, and moderate (150 lbs./ac) N and low (90 lbs./ac) N plots. For each variety, yield columns marked with † are statistically different ($p \leq 0.05$).

Medium tubers were assessed subjectively for Uniformity of Size and Overall Appearance. Scores are presented in Table 55. RV 002 and RV 003 were rated as most uniformly sized from regular N plots. On moderate N, RV 003, EPG 006 and EPG 005 were most uniformly sized.

When comparing individual cultivars, N level appeared to affect scores for Uniformity of Size and Overall Appearance indicating the importance of agronomic data for the production of high quality chipping potatoes.

Table 55: Subjective tuber assessments. Uniformity of Size was subjectively assessed on each replicate by the same individual during the grading process. Overall Appearance was based on uniformity of size and uniformity of shape, skin colour, deformities and eye depth. Data shown is the mean of 4 replicates.

2012	Uniformity of Size[1]	Overall Appearance[2]
Regular N		
Atlantic	3.2	3
Lady Claire	2.8	3
PLP 001	3.4	3.4
Niska	1.6	2.2
RV 002	4	3
RV 003	4	3.6
RV 004	2.6	2.6
ODF 003	3.3	2.8
EPG 005	3.6	3.6
EPG 006	2.8	3.4
Moderate N		
Atlantic	3.3	2.8
Lady Claire	3.0	2.8
PLP 001	3.5	3.8
Niska	3.8	3.0
RV 002	3.5	3.5
ODF 005	2.8	2.8
RV 003	4.0	4.0
RV 004	2.8	2.8
ODF 003	2.8	3.0
EPG 005	4.0	3.8
EPG 006	4.0	3.8
Low N		
Atlantic	4.0	3.8
ODF 005	3.0	2.8

[1] Uniformity of Size: 1 (very variable) - 5 (very uniform)
[2] Overall Appearance: 1 (very poor) - 5 (outstanding)

Tuber samples used to measure specific gravity were evaluated for hollow heart, brown centre, stem-end discoloration, other types of internal necrosis and scab. Very few internal defects were noted for the chipping cultivars evaluated in 2012. Many of the samples had some level of stem-end discoloration. ODF 005 seemed somewhat susceptible to purple pigmentation developing within tubers when grown at the moderate rate of N, but no pigmentation was noted from low N samples.

Chip colour scores of composite samples are presented in Table 56. All of the samples, except EPG 005, gave good chip scores at all levels of N tested. A higher L-value indicates a lighter chip. The lightest chips were produced from Niska grown on both regular N and moderate N. EPG 005 produced chips below a desirable lightness score of 60 and this may be related to maturity issues. These results are from composite samples from one year of testing and additional testing may be required to determine optimal agronomic conditions for chip quality.

Table 56: Chip colour scores from subsamples of each variety grown at full nitrogen (approximately 248 lbs./ac), moderate nitrogen (approximately 150 lbs./ac) and low (approximately 100 lbs./ac) nitrogen. Data shown is the mean of duplicate analyses of a composite sample evaluated on a Hunter Colorimeter (L is a lightness score; higher numbers are lighter).

2012	L		L
Regular N		*Moderate N*	
Atlantic	68.7	Atlantic	64.6
Lady Claire	65.6	Lady Claire	64.0
PLP 001	63.7	PLP 001	64.2
Niska	70.4	Niska	70.5
RV 002	67.9	RV 002	61.1
		ODF 005	67.0
RV 003	69.3	RV 003	64.6
RV 004	64.9	RV 004	68.2
ODF 003	66.4	ODF 003	68.3
EPG 005	51.8	EPG 005	49.8
EPG 006	66.7	EPG 006	66.1
Low N		*Low N*	
Atlantic	68.3	ODF 005	66.8

2013

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the full nitrogen rate (235 lbs/ac) was achieved through a combination of soil fertility (124 lbs./ac N; 361 lbs./ac P, 1930 lbs./ac K), broadcast fertilizer (165 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting and broadcast fertilizer (132 lbs./ac 34-0-0) incorporated at hilling. Fertility for the reduced nitrogen rate (190 lbs./ac) was achieved through a combination of soil fertility and broadcast fertilizer (165 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting. Varieties were planted in four replicate rows in a randomized split block design (with fertility as the main block) along with standard varieties (Atlantic and PLP 001). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 6) to control weeds. Seed of standard cultivars was provided by Edmonton Potato Growers and seed of test cultivars was provided by each participant. Seed was cut (70 to 85 g) and suberized prior to planting. Potatoes were planted May 23, 2013 approximately 5 to 5½"deep using a two-row tuber unit planter. Seed was planted at 30cm spacing in 6m rows spaced 90cm apart.

The potatoes were hilled June 17 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 57). Insecticide was applied July 10 (Matador 120 EC, 40 mL/ac) to control Colorado potato beetle.

Table 57: Foliar fungicides applied to the potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
July 10	Quadris	202 mL/ac
July 20	Bravo 500	0.64 L/ac
Aug 15	Ridomil Gold Bravo	883 mL/ac

Figure 32: Variety evaluation trial at CDCS in Brooks, AB July 30, 2013.

Reglone (1.4 L/ac) was applied September 11 to facilitate mechanical harvest. Tubers were harvested September 23-24 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 10˚C until graded. Tubers were graded into size categories (less than 48mm, 48 – 88mm, and over 88mm). A sample of twenty-five tubers (48 – 88mm) from each replicate was used to determine specific gravity using the weight in air over weight in water method. These tubers were cut longitudinally to assess internal defects. A composite sample of 8 tubers (2 per rep) was stored at 10C until culinary analyses were performed. Samples were evaluated for chip color using a Hunter Colorimeter December 17, 2013.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request. Comparisons for specific cultivars at two rates of N were analyzed using t-tests on a cultivar-by-cultivar basis (Excel; $p \leq 0.05$).

Results and Discussion

Sample hills of each variety were dug for a field day August 22, 2013. Photos of these varieties are shown in Figure 33.

Figure 33. Chipping varieties at the CDCS field day August 22, 2013: a) Atlantic, b) PLP 001, c) EPG013, d) EPG014, e) ODF003, f) ODF006, g) Photo not available of ODF007, h) RV002, i) RV003, j) RV004 and k) RV007.

Yield data (total yield; ton/ac) and specific gravities of each of the cultivars are shown in Table 58. At the regular rate of N (235 lbs./ac), RV 007 yielded significantly more than all other cultivars. Yield of EPG 013 was lowest and was not statistically different from EPG 006. Total yield of most cultivars was not significantly different from that of Atlantic. At a moderate rate of N (190 lbs./ac), the highest yield was observed with RV 007 and RV 003 and RV 004 were not statistically different. EPG 013 was the lowest yielding cultivar at this level of N. For each

cultivar, a t-test was applied to determine whether total yield was significantly affected by the rate of N in the plots. No statistically significant differences were identified for total yield.

Table 58: Estimated total yield (ton/acre) and specific gravity for each variety grown at full nitrogen (approximately 235 lbs./ac) and moderate nitrogen (approximately 190 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2013 Chippers	Yield (ton/ac)	SG
Regular N		
Atlantic	32.6 b	1.098 ab
PLP 001	32.4 b	1.088 bcd†
RV 002	33.5 b	1.088 bcd
EPG 013	22.4 c	1.096 ab†
EPG 014		
RV 003	32.1 b	1.096 cd
RV 007	45.1 a	1.102 abc
RV 004	33.2 b	1.093 abc
ODF 003	32.8 b	1.084 cd†
EPG 006	28.8 bc	1.078 d
Moderate N		
Atlantic	34.4 bc	1.093 ab
PLP 001	30.5 bc	1.098 a†
RV 002	32.5 bc	1.082 cd
EPG 013	21.7 d	1.077 d†
EPG 014	31.3 bc	1.084 bcd
RV 003	37.0 ab	1.093 abc
RV 007	43.0 a	1.092 abc
RV 004	36.5 ab	1.089 bc
ODF 003	35.8 b	1.093 abc†
EPG 006	28.2 c	1.084 bcd

† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

Specific gravity of the chipping cultivars in this trial ranged from 1.078 for EPG 013 to 1.102 for RV 007 from the regular N plots and from 1.077 for EPG 013 to 1.098 for PLP 001 grown on moderate N plots (Table 2). Potatoes selected as chipping cultivars, typically have specific gravities above 1.080 in Alberta and the majority of entries in this trial were well above this level of solids. Nitrogen level had a significant effect on specific gravity of three cultivars, PLP 001, EPG 013 and ODF 003. Growing potatoes at higher levels of N usually results in a decrease in tuber specific gravity and this was the case for ODF 003 and PLP 001 in this trial.

The trial was designed to provide regional data for a wide range of potato cultivars. The N rate in the moderate N plots was approximately 45 lbs./ac lower than the regular rate. The N rates may not have been sufficiently different to impact yield and specific gravity of all cultivars tested. Addressing the agronomic needs of each cultivar may well result in improvements to yield and size profiles when compared to the results in this trial.

The mean percentage of total tuber number in each size category is shown in Table 59. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

In both the regular N and moderate N plots, PLP 001 produced the greatest percentage of potatoes in the small (<48mm) category and RV 004 produced the lowest. The majority of tubers from each cultivar fell into the medium-size (48 – 88mm) category at harvest. Atlantic produced a significantly greater percentage of large (> 88mm) tubers than other cultivars at both levels of N, indicating that the September harvest data was too late for optimal sizing of this cultivar. Few significant differences in size profiles were observed for individual cultivars as a result of N level. A significantly lower percentage of large EPG 013 tubers were produced at the regular level of N compared to the moderate rate, and significantly greater percentage of small RV 007 tubers were produced at this level.

Table 59: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each variety grown at full nitrogen (approximately 235 lbs./ac) and moderate nitrogen (approximately 190 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2013	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Regular N				
Atlantic	15.8 c	63.3 ab	19.0 a	1.8 ab
PLP 001	49.0 a	49.5 b	7.5 c	0.5 b
RV 002	23.3 c	75.3 a	1.8 bc	0.0 b
EPG 013	38.3 b	60.8 ab	0.5 c†	0.5 b
EPG 014				
RV 003	37.5 b	61.8 ab	0.00 d	1.0 b
RV 007	21.3 c†	68.5 a	9.3 b	0.5 b
RV 004	13.8 c	73.8 a	8.3 bc	4.0 a
ODF 003	19.0 c	73.8 a	7.3 bc	0.0 b
EPG 006	22.8 c	74.3 a	2.0 bc	1.0 b
Moderate N				
Atlantic	18.5 cd	55.8 b	23.5 a	2.3 a
PLP 001	45.5 a	53.8 b	0.8 b	0.3 a
RV 002	25.3 abc	71.5 ab	3.0 b	0.3 a
EPG 013	29.0 bc	62.3 ab	8.3 b†	0.8 a
EPG 014	34.3 ab	63.0 ab	2.3 b	0.5 a
RV 003	36.3 ab	62.0 ab	0.5 b	1.0 a
RV 007	15.8 d†	73.5 ab	10.5 b	0.3 a
RV 004	13.3 d	77.5 a	8.0 b	2.0 a
ODF 003	17.8 cd	71.3 ab	11.0 b	0.0 a
EPG 006	20.5 cd	76.0 a	3.0 b	0.8 a

† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 60. At the regular rate of N (235 lbs./ac), PLP 001 and RV 003 yielded significantly more small potatoes than other cultivars. RV 004 and Atlantic produced the lowest yield of smalls, although not statistically different from ODF 003 and EPG 006. In the 48 – 88mm category, RV 007 produced the greatest yield and RV 002, ODF 003 and RV 003 were not statistically different. Atlantic produced the lowest yield in the marketable size category and correspondingly, the highest yield of oversized tubers (> 88mm), likely as a result of harvesting later than ideal for this early maturing variety. Based on the yield data in the oversized category, RV 007 may also be an early cultivar.

On moderate N plots, PLP 001 and RV 003 yielded significantly more small potatoes than other cultivars. Again, RV 007 produced the greatest yield of marketable (48 – 88mm) tubers and RV 002, RV 003, RV 004 and ODF 003 were not statistically different. Yield of large (> 88mm) Atlantic tubers was not statistically different from yield of large RV 007, RV 004 and ODF 003. An earlier harvest may have shifted some of this production into the marketable size category.

N level had a significant impact on the yield of marketable Atlantic and RV 004 tubers, where a greater yield of marketable tubers was harvested from the moderate N plots than from regular N plots. For EPG 013, significantly greater yield of large tubers were produced on moderate N plots than on regular N plots. PLP 001 and RV 007 both produced greater yields of small tubers in regular N plots than when grown in moderate N plots.

Table 60: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each variety grown at full nitrogen (approximately 235 lbs./ac) and moderate nitrogen (approximately 190 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2013	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Regular N				
Atlantic	1.2 d	17.8 d†	12.5 a	1.1 ab
PLP 001	7.7 a†	12.2 bcd	0.7 c	0.8 ab
RV 002	3.1 bc	28.7 ab	1.7 c	0.1 b
EPG 013	3.4 b	18.2 cd	0.5 c†	0.3 ab
EPG 014				
RV 003	6.5 a	24.9 ab	0.3 c	0.4 ab
RV 007	2.7 bc†	31.2 a	10.4 ab	0.8 ab
RV 004	1.2 d	24.1 bcd†	5.8 bc	2.2 a
ODF 003	1.9 cd	26.0 ab	4.9 bc	0.0 b
EPG 006	2.4 bcd	24.5 bc	1.6 c	0.3 ab
Moderate N				
Atlantic	1.1 c	21.0 c†	11.7 a	0.6 a
PLP 001	6.4 a†	23.2 bc	0.7 d	0.2 a
RV 002	2.2 c	27.4 abc	2.6 cd	0.2 a
EPG 013	2.4 c	15.1 d	4.0 bcd†	0.2 a
EPG 014	4.4 b	24.4 bc	2.1 cd	0.3 a
RV 003	6.5 a	29.1 ab	0.7 d	0.6 a
RV 007	2.0 c†	31.2 a	9.7 a	0.2 a
RV 004	1.4 c	27.8 ab†	6.7 abc	0.7 a
ODF 003	1.7 c	26.3 abc	7.9 ab	0.0 a
EPG 006	1.9 c	23.7 bc	2.1 cd	0.5 a

† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

A comparison of medium potatoes (48 – 88mm) for each variety from regular and moderate N plots is shown in Figure 34.

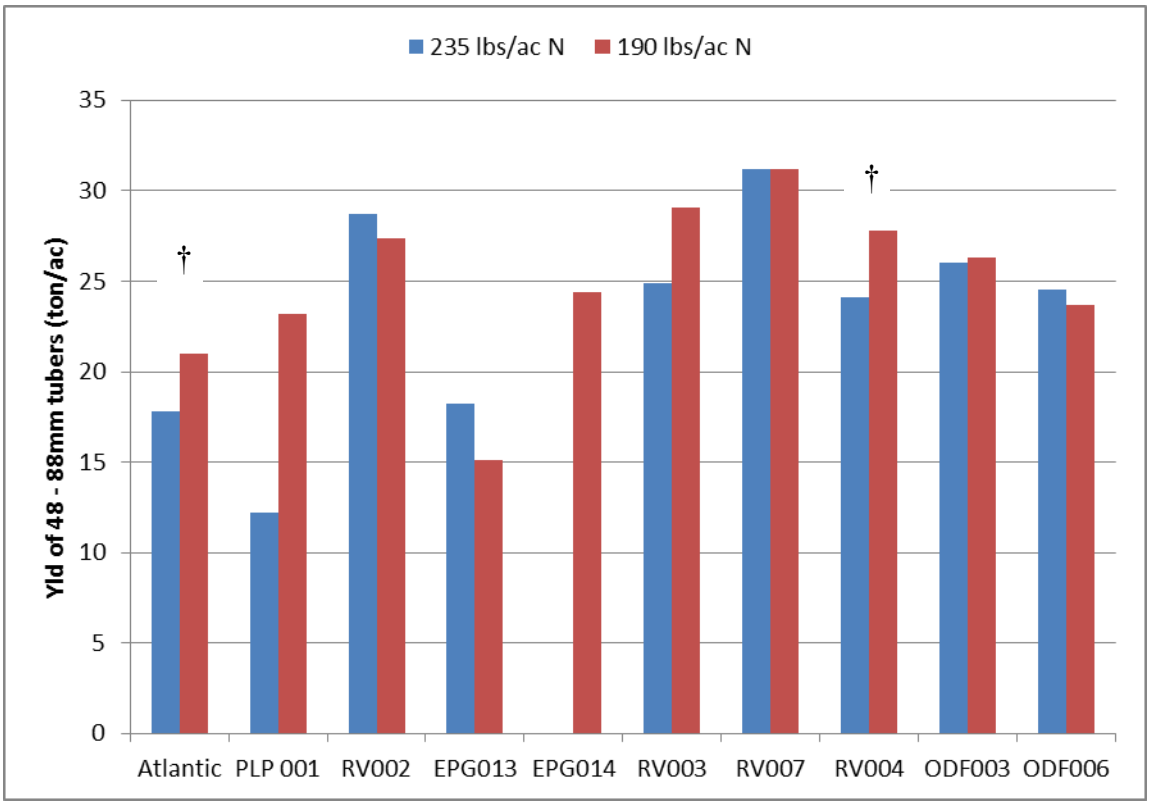

Figure 34: Yield (yon/ac) of potatoes (48 – 88mm) produced on regular (235 lbs./ac) N and moderate (190 lbs./ac) N plots. For each variety, yield columns marked with † are statistically different ($p \leq 0.05$).

Medium tubers were assessed subjectively for Uniformity of Size and Overall Appearance. Scores are presented in Table 61. At the regular rate of N, EPG 006 tubers appeared most uniform, but only EPG 013 scored significantly lower on this assessment. ODF 003 and Atlantic scored highest for Overall Appearance and scores for RV 002, RV 003, RV 004 and EPG 006 tubers were not statistically different.

On moderate N, no significant differences were observed between cultivars for Uniformity of Size. RV 002 and RV 003 scored highest for Overall Appearance and only EPG 006 scored significantly lower.

When comparing the Overall Appearance of individual cultivars, N level significantly affected scores for Atlantic, PLP 001, RV 002, EPG 013, and EPG 006, indicating the importance of agronomic data for the production of high quality chipping potatoes.

Table 61: Subjective tuber assessments: Uniformity of Size was subjectively assessed on each replicate by the same individual during the grading process. Overall Appearance was based on uniformity of size and uniformity of shape, skin colour, deformities and eye depth. Data shown is the mean of 4 replicates.

2013	Uniformity of Size[1]	Overall Appearance[2]
Regular N		
Atlantic	3.75 a	4.00 a†
PLP 001	3.50 a	2.25 c†
RV 002	3.00 a	3.25 ab†
EPG 013	2.00 b	2.25 c†
EPG 014		
RV 003	3.50 a	3.50 ab
RV 007	3.25 a	2.75 bc
RV 004	3.25 a	3.50 ab
ODF 003	3.75 a	4.00 a
EPG 006	4.00 a	3.75 ab†
Moderate N		
Atlantic	2.75 a	3.00 ab†
PLP 001	3.50 a	3.25 ab†
RV 002	4.00 a	4.00 a†
EPG 013	4.00 a	3.75 a†
EPG 014	3.00 a	3.25 ab
RV 003	3.75 a	4.00 a
RV 007	3.25 a	3.50 a
RV 004	2.75 a	3.25 ab
ODF 003	3.50 a	3.50 a
EPG 006	3.00 a	2.25 b†

[1] Uniformity of Size: 1 (very variable) – 5 (very uniform)
[2] Overall Appearance: 1 (very poor) – 5 (outstanding)
† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

Tuber samples used to measure specific gravity were evaluated for hollow heart, brown centre, stem-end discoloration, other types of internal necrosis and scab. EPG 013 tubers had approximately 5% hollow heart when grown in regular N plots and 4% hollow hear when grown on moderate N. Atlantic tubers had approximately 3% hollow hear on the regular N plots. ODF 003 tubers had 8% hollow hear when grown on moderate N. Many of the samples had some level of stem-end discoloration. RV 007, RV 004, and PLP 001 had some level of stem-end discoloration at both levels of N and ODF 003, EPG 013, EPG 014 and EPG 006 when grown in moderate N plots. EPG 013 seemed somewhat susceptible to purple pigmentation developing within tubers and this may be a concern for chip production.

Chip colour scores of composite samples are presented in Table 62. All of the samples gave good chip scores. A higher L-value indicates a lighter chip. The lightest chips were produced from PLP 001 and RV 004 grown on regular N and from ODF 003 grown on moderate N. Atlantic produced chips just below a desirable lightness score of 60 when grown on regular N. All of the cultivars, except RV 002, produced chips with scores higher than 60 when grown on moderate N.

Reducing the N applied to the crop resulted in significantly lighter chip scores for Atlantic, RV 007 and ODF 003. PLP 001, RV 003, RV 004 and EPG 006 produced lighter chips when grown on regular N plots compared to the moderate rate of N. These are composite samples from one year of testing and additional testing may be required to determine optimal agronomic conditions for chip quality.

Table 62: Chip colour scores from subsamples of each variety grown at full nitrogen (approximately 235 lbs./ac) and moderate nitrogen (approximately 190 lbs./ac). Data shown is the mean of duplicate analyses of a composite sample evaluated on a Hunter Colorimeter (L is a lightness score; higher numbers are lighter).

2013	L		L
Regular N		*Moderate N*	
Atlantic	57.9	Atlantic	64.4
PLP 001	70.6	PLP 001	65.9
RV 002	60.2	RV 002	57.6
EPG 013		EPG 013	64.7
EPG 014		EPG 014	65.4
RV 003	66.5	RV 003	60.8
RV 007	58.2	RV 007	63.1
RV 004	68.8	RV 004	63.6
ODF 003	66.0	ODF 003	70.3
EPG 006	67.9	EPG 006	62.7

† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

Conclusions

The 2011 variety trial included a number of chipping potato varieties with potential in southern Alberta. Atlantic and Lady Claire were included in the trial as check varieties. Yield of many of the releases compared well with familiar standard varieties. For all varieties except Atlantic, total yield was higher in the regular N plots (225 lbs./ac) than in the low N plots (115 lbs./ac). The specific gravities of chipping varieties tended to be lower on regular N plots than low N plots, as expected. Fewer large tubers were observed from the low N plots than from the regular N plots. All of the samples except Atlantic grown at 225 lbs./ac N gave good chip scores. There were very few internal defects observed in the tubers examined. Scab was prevalent on one variety.

The 2012 variety trial included eight chipping potato cultivars with potential in southern Alberta. Atlantic, Lady Claire and Niska were included in the trial as check varieties. Seven of the cultivars were included in plots fertilized with a regular rate of N (248 lbs./ac), and eight were grown in plots fertilized with a moderate rate of N (150 lbs./ac) to determine the extent to which N may influence yield, size profile and chipping quality. One cultivar and one check were grown at a low (100 lbs./ac) rate of N. Nitrogen, at the rates tested, had no significant impact on total yield or specific gravity. However, there was a nitrogen response to size profile and yield of specific size categories for some cultivars. RV 002 produced the highest marketable yield at regular and moderate levels of N, but did not out-yield the check varieties. ODF 005 responded well to the low level of N relative to the moderate rate. RV 002 and RV 004 performed very well in the trials and chip color was good for all but one cultivar tested at all levels of N. It was difficult to assess EPG 005 and EPG 006 as seed was delayed and planting dates were late for these cultivars in 2012.

The 2013 variety trial included nine chipping potato cultivars with potential in southern Alberta. Atlantic and PLP 001 were included in the trial as check varieties. Eight of the cultivars were included in plots fertilized with a regular rate of N (235 lbs./ac) as well as in plots fertilized with a moderate rate of N (190 lbs./ac) to determine the extent to which N may influence yield, size profile and chipping quality. Nitrogen, at the two rates tested, had no significant impact on total yield or specific gravity. However, there was a nitrogen response to size profile for some cultivars. RV 007 produced the highest marketable yield at both levels of N and out-yielded both check varieties. RV 004 and Atlantic both responded well to the moderate level of N relative to the regular rate. RV 003, ODF 003, RV 002 and RV 004 all performed well in the trials and chip color was good for all cultivars tested at one or both levels of N. It was difficult to assess EPG 014 fully as a limited quality of seed was available for the 2013 season.

The trial was designed to provide regional data for a wide range of potato cultivars. In 2011, the N rate in the low N plots was over 100 lbs./ac lower than the regular rate. A rate of N that is intermediate may give better results than either full or low N. Addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

Fresh Market Variety Evaluation

2011

Materials and Methods

The majority of variety evaluations were conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the full nitrogen rate was achieved through a combination of soil fertility (105 lbs./ac N; 214 lbs./ac P, 720 lbs./ac K), and broadcast fertilizer (350 lbs./ac of 34-17-0) incorporated at hilling. Fertility for the low nitrogen rate was achieved through a combination of soil fertility and broadcast fertilizer (100 lbs./ac of 11-52-0) incorporated at hilling. Varieties were planted in four replicate rows in a randomized split block design (with fertility as the main block) along with three standard varieties (Norland, Dark Red Norland, and Yukon Gold). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 13) to control weeds. Seed of standard cultivars was provided by Alberta Seed Producers Inc. (ASPI), Edmonton Potato Growers (EPG) and BPS Ltd. and seed of test cultivars was provided by each participant. Potatoes were planted May 30, 2011 approximately 12 to 14 cm deep using a two-row tuber unit planter. Seed was planted at 30 cm spacing in 6 m rows spaced 90 cm apart. Seed was planted as single drop with the exception of some of the larger varieties. Cut seed (70 to 85 g) was suberized prior to planting.

The potatoes were hilled June 8 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 63). Insecticide was applied July 17 (Decis 5 EC, 50 mL/ac) to control Colorado potato beetle.

Table 63: Foliar fungicides applied to the potato crop at CDCS to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
July 18	Bravo 500	0.64 L/ac
Aug 2	Bravo 500	0.64 L/ac
Aug 23	Dithane DG Rainshield	0.91 kg/ac

Figure 35: Variety evaluation trial at CDCS in Brooks, AB July 22, 2011.

Reglone (1.4 L/ac) was applied September 6 and re-applied (1.0 L/ac) September 12 to facilitate mechanical harvest. Tubers were harvested September 21 – 26 with a one-row Grimme harvester for yield and grade data.

Two varieties and one check were planted in replicate rain-fed plots at CDCN in Edmonton, AB. Fertility for the CDCN (approximately 180 lbs./ac N) site was achieved through a combination of soil fertility (93 lbs./ac N; 120 lbs./ac P, 653 lbs./ac K), and broadcast fertilizer (170 lbs./ac of 46-0-0 and 120 lbs./ac 0-50-17) incorporated prior to planting. Varieties were planted in four replicate rows in a randomized complete block design along with one standard variety (Yukon Gold). Each block was planted adjacent to guard rows to reduce any edge effects.

Tubers were stored at 10˚C until graded. Some clients preferred size data for fresh market cultivars. For these cultivars, tubers were graded into size categories (less than 48mm, 48 – 88mm, and over 88mm). Varieties were evaluated for several other quality parameters during the grading process including uniformity of shape, uniformity of size, eye depth, and overall appearance following the guidelines for the former Western Canadian Potato Breeding Program. Uniformity of shape and uniformity of size were estimated using a scale of 1 to 5 where 1 is most variable and 5 is most uniform. Eye depth was estimated using a scale of 1 to 5 where 1 is deep and 5 is very shallow. Overall appearance was rated on a scale of 1 to 5 where 1 is very poor and 5 is outstanding.

Some clients preferred to have fresh market cultivars graded into weight categories. For these clients, tubers were graded into weight categories (less than 4 oz., 4 to 6 oz., 6 to 10 oz., and over 10 oz.). Varieties were evaluated for several other quality parameters during the grading process including uniformity of shape, uniformity of size and eye depth following the guidelines for the former Western Canadian Potato Breeding Program. Uniformity of shape and uniformity of size were estimated using a scale of 1 to 5 where 1 is most variable and 5 is most uniform. Eye depth was estimated using a scale of 1 to 5 where 1 is deep and 5 is very shallow.

A sample of twenty-five tubers (48 – 88mm or 4 to 10 oz.) from each replicate was used to determine specific gravity using the weight in air over weight in water method. These tubers were cut longitudinally to assess internal defects. A composite sample of 8 tubers (2 per rep) was stored at 8˚C until culinary analyses could be performed. Samples were evaluated for baking and boiling December 1 - 15.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request.

Results and Discussion – Graded into Size Categories

Sample hills of each variety were dug for a field day at CDCS August 24, 2011. Photos of these varieties are shown in Figure 36.

Figure 36. Fresh market varieties at the CDCS field day August 24, 2011: a) ASPI 002, b) ASPI 001, c) DR Norland, d) EPG 002, e) EPG 003, f) EPG 004, g) Norland, h) Solanum 001, i) Solanum 002, j) Solanum 003, k) Solanum 004, l) Tuberosum 001, m) Tuberosum 002, n) Tuberosum 003, o) Tuberosum 004, and p) Yukon Gold.

Yield data (total yield; ton/ac) and specific gravities of each of the releases are shown in Table 64. The highest total yield at CDCS was observed with Solanum 001 on regular N, and total yield of ASPI 002, Dark Red Norland, and Tuberosum 001 were not statistically less than that of Solanum 001. At CDCN, ASPI 002 yielded significantly better than ASPI 001 or Yukon Gold.

The highest total yield on low N was observed with Tuberosum 001 and total yield of Tuberosum 002, Tuberosum 003, Tuberosum 004 and Yukon Gold were not statistically different. Yields of Norland, Tuberosum 001, Tuberosum 003 and Tuberosum 004 were significantly greater from the regular fertility plots than from the low fertility plots at CDCS indicating that the low fertility rate was sub-optimal for yield. The trial was designed to provide regional data for a wide range of potato cultivars. The N rate in the low N plots was over 100 lbs./ac lower than the regular rate at CDCS. A rate of N that is intermediate may give better results than either full or low N. Further addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

Yukon Gold had the highest specific gravity of the fresh market selections grown at CDCS, statistically greater than Solanum 001 and Tuberosum 002. The specific gravity of Yukon Gold was also significantly higher in the low fertility plots than that of Norland, Tuberosum 001, Tuberosum 002, and Tuberosum 004. When comparing the specific gravity of tubers grown at both fertility levels, only the specific gravity of Tuberosum 001 was significantly higher when grown on low fertility than in regular fertility plots. At CDCN, the specific gravity of Yukon Gold was higher than for ASPI 002 but not significantly different from ASPI 001.

Table 64: Estimated total yield (ton/acre) and specific gravity for each variety grown at full nitrogen (approximately 225 lbs./ac at CDCS and 180 lbs./ac at CDCN) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS – 2011 Fresh Market by Size	Yield (ton/ac)	SG
Regular N		
ASPI 001	24.5 cde	1.079 a
ASPI 002	36.2 ab	1.069 ab
DR Norland	31.6 abc	1.064 ab
EPG 002	25.6 cde	1.076 ab
EPG 003	26.6 cde	1.068 ab
EPG 004	22.5 de	1.074 ab
Norland	22.2 e	1.066 ab
Solanum 001	39.8 a	1.055 b
Solanum 002	23.8 cde	1.068 ab
Solanum 003	30.6 bcde	1.074 ab
Solanum 004	28.2 bcde	1.067 ab
Tuberosum 001	31.2 abcd	1.065 ab
Tuberosum 002	24.3 cde	1.060 b
Tuberosum 003	26.2 cde	1.071 ab
Tuberosum 004	24.2 cde	1.071 ab
Yukon Gold	25.3 cde	1.082 a
Low N		
Norland	15.2 q†	1.066 r
Tuberosum 001	22.8 p†	1.071 qr†
Tuberosum 002	17.9 pq	1.066 r
Tuberosum 003	18.4 pq†	1.076 pq
Tuberosum 004	20.6 p†	1.071 qr
Yukon Gold	21.5 p	1.081 p
CDCN	Yield (ton/ac)	SG
Regular N		
ASPI 001	12.9 z	1.090 xy
ASPI 002	22.2 x	1.085 y
Yukon Gold	16.4 y	1.096 x

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

The mean percentage of total tuber number in each size category is shown in Table 65. It is important to note that harvesting with small plot equipment and manual labour recovers all

potatoes over 19mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

In the regular N plots, Solanum 002 produced the greatest percentage of potatoes in the small (<48mm) category, although only statistically different from Yukon Gold. Conversely, Yukon Gold produced the greatest percentage of tubers in the medium (48-88mm) category, only statistically different from Solanum 002. There were no statistically significant differences in the percentage of tuber number in the large (> 88mm) or deformed size categories.

In the low N plots, Tuberosum 003 produced a significantly greater percentage of small tubers (< 48mm) than other varieties, while Yukon Gold, Tuberosum 004, Tuberosum 001 and Norland, a significantly lower percentage of small tubers. Tuberosum 004 produced the greatest percentage of medium tubers (48 – 88mm) and Tuberosum 003 produced the lowest percentage of medium tubers. Yukon Gold produced the highest percentage of large tubers (> 88mm), while Tuberosum 002 and Tuberosum 003 produced none. Tuberosum 004 yielded a significantly lower percentage of small and large potatoes and significantly greater percentage of medium potatoes when grown in low fertility plots compared to regular fertility plots. There were no statistically significant differences in the deformed size categories from the low N plots. A significantly lower percentage of large tubers were observed with Norland, Tuberosum 003 and Tuberosum 004 from the low N plots than from the regular N plots.

At CDCN, there were no statistical differences between varieties in the percentage of tubers in the small or medium size classes. Yukon Gold produced a significantly greater percentage of large and deformed tubers than the ASPI varieties.

Table 65: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each variety grown at full nitrogen (approximately 225 lbs./ac at CDCS and 180 lbs./ac at CDCN) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS - 2011	< 48mm	48 to 88mm	> 88mm	Deformed
Regular N				
ASPI 001	27.3 ab	71.7 ab	0.7	0.3
ASPI 002	21.3 ab	74.2 ab	1.9	2.6
DR Norland	22.0 ab	70.7 ab	6.4	0.9
EPG 002	44.8 ab	55.2 ab	0.0	0.0
EPG 003	22.2 ab	72.1 ab	5.6	0.2
EPG 004	51.9 ab	48.0 ab	0.0	0.1
Norland	26.1 ab	66.1 ab	6.3	1.5
Solanum 001	30.4 ab	66.4 ab	2.7	0.5
Solanum 002	65.3 a	34.5 b	0.0	0.1
Solanum 003	30.6 ab	63.9 ab	0.3	5.3
Solanum 004	35.2 ab	64.3 ab	0.2	0.3
Tuberosum 001	21.8 ab	74.7 ab	3.3	0.1
Tuberosum 002	44.7 ab	54.9 ab	0.1	0.3
Tuberosum 003	39.3 ab	53.7 ab	6.8	0.2
Tuberosum 004	35.4 ab	59.4 ab	6.1	0.0
Yukon Gold	19.9 b	75.5 a	4.3	0.3
Low N				
Norland	24.0 r	74.5 p	1.3 pq†	0.2
Tuberosum 001	21.5 r	77.5 p	0.9 pq	0.3
Tuberosum 002	48.0 q	52.0 q	0.0 q	0.1
Tuberosum 003	75.7 p	24.3 r	0.0 q†	0.1
Tuberosum 004	17.7 r†	78.0 p†	4.1 pq†	0.2
Yukon Gold	19.5 r	69.5 p	9.2 p	1.7
CDCN	< 48mm	48 to 88mm	> 88mm	Deformed
Regular N				
ASPI 001	24.0	75.7	0.3 y	0.3 y
ASPI 002	21.0	75.8	0.8 y	2.5 y
Yukon Gold	16.0	76.5	2.0 x	6.3 x

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 66. In the regular N plots, Solanum 002 produced the greatest yield of small (< 48mm) potatoes, only significantly different from Yukon Gold and EPG 003. Solanum 001 and ASPI 002 gave the greatest yield of medium (48 – 88mm) potatoes but were not statistically different from Dark Red Norland, Solanum 003, Solanum 004 and Tuberosum 001. There were no statistically significant differences in the large (> 88mm) or deformed size categories from regular N plots.

In the low N plots, Tuberosum 003 produced the greatest yield of small (< 48mm) potatoes, but not statistically more than Tuberosum 001 or Tuberosum 002. The greatest yield of medium (48 – 88mm) potatoes was observed with Tuberosum 001 and Tuberosum 004 and Yukon Gold were not statistically different. For Tuberosum 001, Tuberosum 003 and Yukon Gold, yield of medium (48 – 88mm) tubers was significantly higher in the regular N plots than in the low N plots.

At CDCN, Yukon Gold yielded significantly less small potatoes than the ASPI varieties. ASPI 002 produced a significantly greater yield of medium potatoes. ASPI 001 produced the lowest yield of large and deformed tubers, although not statistically different from ASPI 002.

Table 66: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each variety grown at full nitrogen (approximately 225 lbs./ac at CDCS and 180 lbs./ac at CDCN) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS - 2011	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Regular N				
ASPI 001	2.7 ab	21.2 bc	0.5	0.1
ASPI 002	2.0 ab	30.5 a	2.0	1.6
DR Norland	2.1 ab	24.2 abc	4.9	0.4
EPG 002	6.7 ab	18.8 bcd	0.0	0.0
EPG 003	1.9 b	21.2 bc	3.6	0.0
EPG 004	6.9 ab	15.6 cd	0.0	0.0
Norland	2.0 ab	16.0 cd	3.9	0.4
Solanum 001	5.8 ab	30.7 a	3.0	0.4
Solanum 002	12.1 a	11.7 d	0.0	0.1
Solanum 003	4.6 ab	23.7 abc	0.3	2.0
Solanum 004	5.4 ab	22.5 abc	0.2	0.1
Tuberosum 001	2.1 ab	26.4 ab	2.6	0.1
Tuberosum 002	5.9 ab	18.1 bcd	0.2	0.4
Tuberosum 003	5.9 ab	16.1 cd	4.0	0.1
Tuberosum 004	4.6 ab	16.4 cd	3.3	0.0
Yukon Gold	1.8 b	20.3 bcd	3.1	0.1
Low N				
Norland	1.6 pq	13.0 qr	0.6 pq†	0.0
Tuberosum 001	2.1 pq	20.0 p†	0.6 pq	0.1
Tuberosum 002	5.3 pq	12.6 qr	0.0 q	0.0
Tuberosum 003	11.1 p	7.2 r†	0.0 q	0.0
Tuberosum 004	1.2 q	17.4 pq	2.0 pq	0.0
Yukon Gold	1.1 q	15.4 pq†	4.5 p	0.5
CDCN	< 48mm	48 to 88mm	> 88mm	Deformed
Regular N				
ASPI 001	1.2 x	11.5 y	0.1 y	0.1 y
ASPI 002	1.4 x	19.4 x	0.6 xy	1.1 xy
Yukon Gold	0.6 y	14.0 y	0.8 x	1.0 x

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

A comparison of medium potatoes (48 – 88mm) for each variety from regular and low fertility plots is shown in Figure 37.

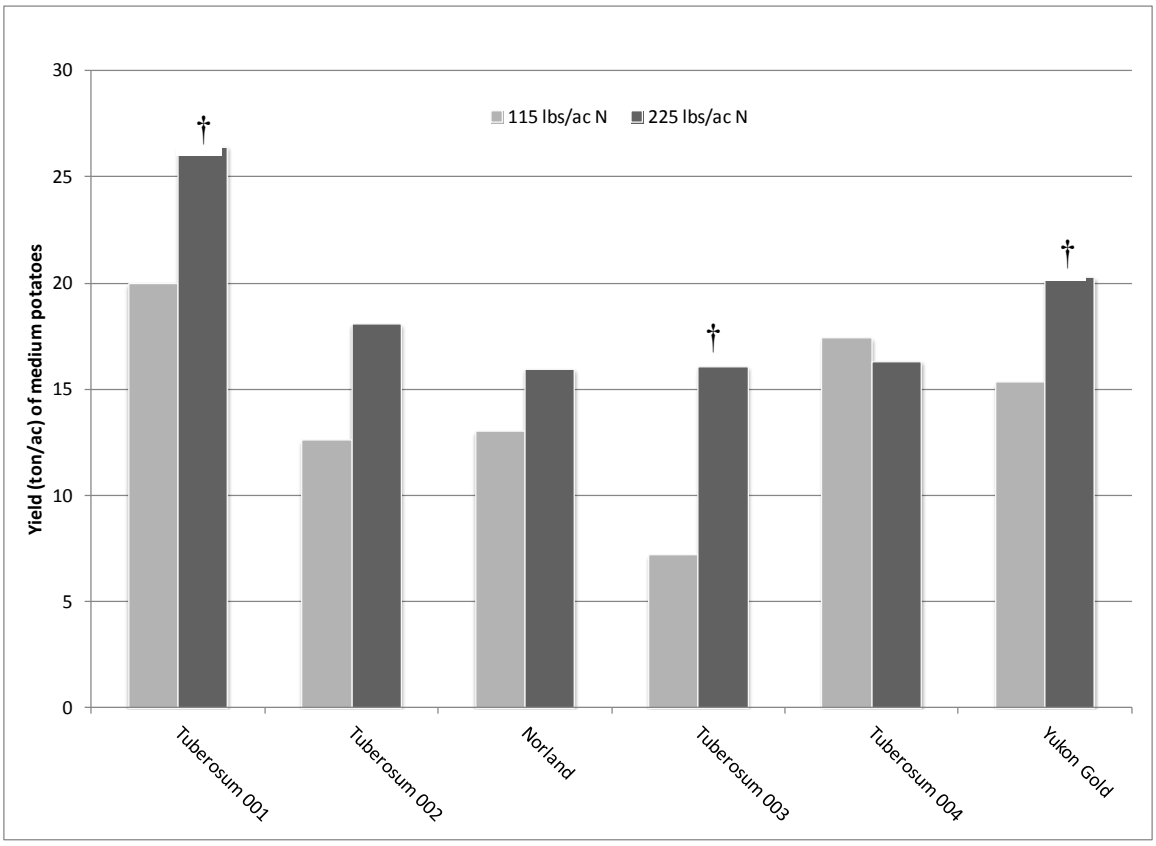

Figure 37: Yield of potatoes (48 – 88mm) produced on low (115 lbs./ac) and regular (225 lbs./ac) N at CDCS. For each variety, columns marked with † are statistically different ($p \leq 0.05$).

Varieties were evaluated for several other quality parameters during the grading process including uniformity of shape, uniformity of size, eye depth, and overall appearance. The results of these subjective assessments are presented in Table 67. There were no significant differences between varieties grown at CDCS in terms of uniformity, eye depth or overall appearance. At CDCN, ASPI 001 exhibited greater uniformity of shape than Yukon Gold and the eyes were significantly shallower on ASPI 001 tubers than those of Yukon Gold.

Table 67: Uniformity of shape, uniformity of size, eye depth, and overall appearance of each variety grown at full nitrogen (approximately 225 lbs./ac at CDCS and 180 lbs./ac at CDCN) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS - 2011	Uniformity of Shape	Uniformity of Size	Eye Depth	Overall Appearance
Regular N				
ASPI 001	3.8	3.5	3.3	3.5
ASPI 002	3.0	3.0	3.0	3.0
DR Norland	3.0	3.0	3.0	3.0
EPG 002	3.8	3.8	3.5	3.5
EPG 003	2.8	3.0	3.0	3.0
EPG 004	2.8	3.0	3.8	3.0
Norland	3.0	3.0	3.0	3.0
Solanum 001	3.0	3.0	3.0	3.0
Solanum 002	2.8	3.3	3.0	3.0
Solanum 003	3.0	3.0	3.0	3.0
Solanum 004	3.0	3.0	3.3	3.3
Tuberosum 001	2.3	2.5	3.0	2.8
Tuberosum 002	3.0	3.3	3.0	3.0
Tuberosum 003	3.0	2.8	3.0	3.0
Tuberosum 004	3.0	2.8	3.0	3.0
Yukon Gold	3.0	3.0	3.3	3.0
Low N				
Norland	3.0	3.0	3.0	3.0
Tuberosum 001	3.0	3.0	3.0	3.0
Tuberosum 002	3.3	3.3	3.0	3.0
Tuberosum 003	3.0	3.0	3.3	3.0
Tuberosum 004	3.0	3.0	3.0	3.0
Yukon Gold	3.0	3.0	3.0	3.0
CDCN	Uniformity of Shape	Uniformity of Size	Eye Depth	Overall Appearance
Regular N				
ASPI 001	3.8 a	2.3	4.0 a	3.3
ASPI 002	3.3 ab	2.3	3.8 ab	3.3
Yukon Gold	2.5 b	2.0	2.8 b	2.3

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

Tuber samples used to measure specific gravity were evaluated for hollow heart (HH), brown centre (BC), stem-end discoloration (SED), other types of internal necrosis and scab. Subsamples of ASPI 002, EPG 002, Norland, Tuberosum 003, and Tuberosum 004 were free of any internal defects. There were very few internal defects observed in the other varieties examined, except for Yukon Gold where stem-end discoloration was common and hollow heart and vascular discoloration were observed in at least one tuber of each subsample. Solanum 001 and Solanum 002 had brown centre in one tuber of one subsample. EPG 003 and Solanum 003 showed some evidence of hollow heart and/or brown centre and several subsamples had anthocyanin present in the tubers (PP), usually a variety characteristic. ASPI 002, Dark Red Norland, Solanum 004, and Tuberosum 002 had some stem-end discoloration and Tuberosum 001 had some vascular discoloration (VD), possibly a result of immaturity at the time desiccant was applied. EPG 004 had one subsample with evidence of hollow heart and was the only variety with common scab lesions present on one tuber.

Varieties were evaluated in the Food Science lab at CDCS for culinary quality. Data from the boil and bake evaluations is presented in Table 68.

Table 68: Culinary evaluations of each variety grown at full nitrogen (approximately 225 lbs./ac at CDCS and 180 lbs./ac at CDCN) and low nitrogen (approximately 115 lbs./ac). Data shown is the mean of duplicate analyses of a composite sample.

Boiled Potatoes

CDCS - 2011	Flesh color	Waxiness†	Sloughing	After Cooking Discoloration
Regular N				
ASPI 001	yellow	3	moderate	none
ASPI 002	off-white	3	little or no	none
DR Norland	off-white	3	moderate	moderate
EPG 002	yellow	3	little or no	none
EPG 003	off-white	3	little or no	none
EPG 004	yellow	2	moderate	moderate
Norland	yellow	2	little or no	none
Solanum 001	yellow	2	little or no	none
Solanum 002	deep yellow	3	little or no	none
Solanum 003	deep yellow	4	little or no	none
Solanum 004	deep yellow	3	little or no	none
Tuberosum 001	deep yellow	3	little or no	none
Tuberosum 002	yellow	3	little or no	none
Tuberosum 003	yellow	3	little or no	none
Tuberosum 004	off-white	2	little or no	none
Yukon Gold	deep yellow	4	moderate	none
Low N				
Norland	off-white	3	little or no	none
Tuberosum 001	yellow	3	little or no	none
Tuberosum 002	off-white	2	little or no	none
Tuberosum 003	n/a	n/a	n/a	n/a
Tuberosum 004	yellow	2	little or no	none
Yukon Gold	deep yellow	4	severe	none
CDCN	Flesh color	Waxiness	Sloughing	After Cooking Discoloration
Regular N				
ASPI 001	off-white	3	little or no	none
ASPI 002	off-white	2	little or no	none
Yukon Gold	deep yellow	4	little or no	none

† Waxiness: 1 = very waxy (very clean cuts); 2 = waxy (clean cuts with some residue); 3 = slightly waxy (more mealy than waxy); 4 = not waxy (fluffy/mealy)

Table 68 continued.

Baked Potatoes			
CDCS - 2011	Flesh color	Texture*	After Cooking Discoloration
Regular N			
ASPI 001	off-white	3	none
ASPI 002	off-white	2	none
DR Norland	yellow	1	none
EPG 002	yellow	3	none
EPG 003	off-white	3	none
EPG 004	yellow	2	none
Norland	yellow	3	none
Solanum 001	off-white	2	none
Solanum 002	deep yellow	2	none
Solanum 003	deep yellow	3	none
Solanum 004	deep yellow	2	none
Tuberosum 001	deep yellow	4	none
Tuberosum 002	yellow	2	none
Tuberosum 003	yellow	3	none
Tuberosum 004	deep yellow	3	none
Yukon Gold	deep yellow	3	none
Low N			
Norland	yellow	3	none
Tuberosum 001	deep yellow	4	none
Tuberosum 002	yellow	2	none
Tuberosum 003	yellow	3	none
Tuberosum 004	deep yellow	4	none
Yukon Gold	deep yellow	3	none
CDCN	Flesh color	Texture	After Cooking Discoloration
Regular N			
ASPI 001	off-white	3	none
ASPI 002	off-white	3	none
Yukon Gold	yellow	4	none

* Texture: 1 = wet; 2 = slightly wet; 3 = slightly mealy; 4 = mealy

Results and Discussion – Graded into Weight Categories

Sample hills of each variety were dug for a field day at CDCS August 24, 2011. Photos of these varieties are shown in Figure 38.

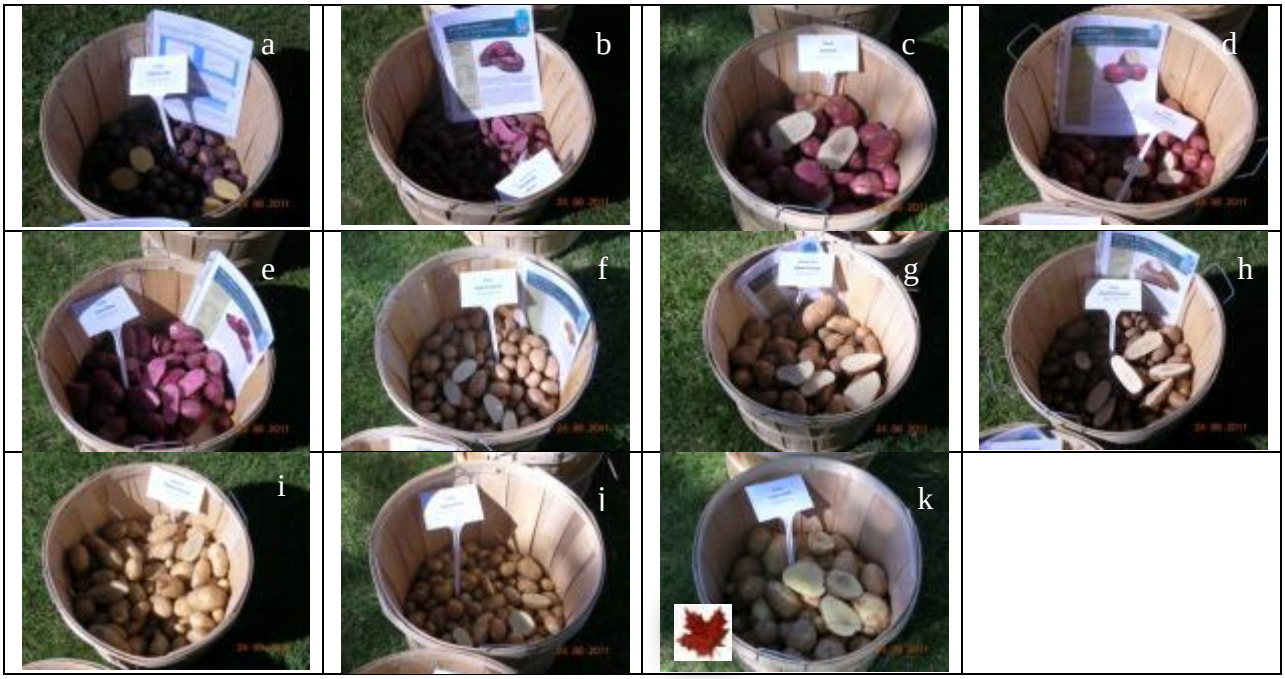

Figure 38. Fresh market varieties at the CDCS field day August 24, 2011: a) A99326-1PY*, b) Amarosa, c) Norland, d) Red Sunset*, e) Terra Rosa, f) Alpine Russet*, g) Blazer Russet, h) Owyhee Russet*, i) Tebina Russet, j) Yukon Gem*, and k) Yukon Gold. Varieties marked with an asterisk were planted as mini-tubers approximately 1 week after the other varieties.

Yield data (total yield; ton/ac) and specific gravities of each of the releases are shown in Table 69. The highest total yield of these fresh market varieties was observed with Tebina Russet and total yield of Yukon Gold was not statistically different.

The highest total yield on low N was observed with Tebina Russet and total yields of Yukon Gold and Blazer Russet were not statistically different. Yields of Norland were significantly greater from the regular N plots than from the low N plots at CDCS indicating that the low N rate was sub-optimal for yield. The trial was designed to provide regional data for a wide range of potato cultivars. The N rate in the low N plots was over 100 lbs./ac lower than the regular rate at CDCS. A rate of N that is intermediate may give better results than either full or low N. Further addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

Terra Rosa had the highest specific gravity of these fresh market selections grown at CDCS, and Yukon Gold was not statistically different. Noland and Red Sunset had the lowest specific gravity on regular N. The specific gravity of Yukon Gold and Tebina Russet were the highest in the low fertility plots and were statistically higher than that of Norland. There were no significant differences in specific gravity of varieties grown on regular N compared to the low N plots.

Table 69: Estimated total yield (ton/acre) and specific gravity for each variety grown at full nitrogen (approximately 225 lbs./ac at CDCS and 180 lbs./ac at CDCN) and low nitrogen (approximately 115 lbs./ac). Varieties marked with an asterisk were planted as mini-tubers later than other varieties. Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS – 2011 Fresh Market by Weight	Yield (ton/ac)	SG
Regular N		
A99326-1PY*	20.6 bc	1.072 e
Amarosa	16.3 c	1.073 de
Norland	22.2 bc	1.066 f
Red Sunset*	16.5 bc	1.062 f
Terra Rosa	21.2 bc	1.087 a
Alpine Russet*	19.0 bc	1.080 bc
Blazer Russet	19.7 bc	1.077 bcde
Owyhee Russet*	17.5 bc	1.083 ab
Tebina Russet	31.0 a	1.079 bcd
Yukon Gem*	20.5 bc	1.076 c
Yukon Gold	25.3 ab	1.082 abc
Low N		
Norland	15.2 q†	1.066 q
Blazer Russet	18.6 pq	1.075 p
Tebina Russet	30.1 p	1.081 p
Yukon Gold	21.7 pq	1.081 p

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

* Varieties marked with an asterisk were planted as mini-tubers approximately 1 week after the other varieties.

The mean percentage of total tuber number in each size category is shown in Table 70. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

In the regular N plots, Amarosa produced the highest percentage of potatoes in the small (< 4 oz.) category, statistically greater than all other varieties. Conversely, Amarosa produced the lowest percentage of tubers in the 4 to 6 oz. category. Yukon Gold yielded the greatest percentage of tubers in the 6 to 10 oz. range and Blazer Russet and Norland were not statistically different. Blazer Russet yielded the greatest percentage of tubers over 10 oz., although only statistically different from Amarosa which did not produce any tubers over 10 oz. There were no statistically significant differences in the percentage of tuber number in the deformed size category.

In the low N plots, Tebina Russet produced a significantly greater percentage of small tubers (< 48mm) than other varieties. There were no significant differences in the percentage of tubers in the 4 to 6 oz. category for varieties grown on low N. Blazer Russet produced a significantly higher percentage of 6 to 10 oz. tubers than Tebina Russet when grown on low N. Yukon Gold produced a significantly higher percentage of tubers over 10 oz. than Tebina Russet in the low N plots. There were no statistically significant differences in the percentage of tuber number in the deformed size category. There were no significant differences in the percentage of tubers in each size category when varieties grown on regular N were compared to the low N plots.

Table 70: Percentage of total tuber number in each size category (< 4 oz., 4 to 6 oz., 6 to 10 oz., > 10 oz. and deformed) for each variety grown at full nitrogen (approximately 225 lbs./ac) and low nitrogen (approximately 115 lbs./ac). Varieties marked with an asterisk were planted as mini-tubers later than other varieties. Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS – 2011	< 4 oz.	4 to 6 oz.	6 to 10 oz.	> 10 oz.	Deformed
Regular N					
A99326-1PY*	71.0 b	18.4 a	8.8 def	1.4 ab	0.4
Amarosa	92.0 a	7.3 b	0.7 f	0.0 b	0.0
Norland	32.8 d	20.7 a	24.8 ab	26.2 a	1.5
Red Sunset*	63.6 bc	18.8 a	14.0 cde	3.2 ab	0.5
Terra Rosa	51.8 c	19.8 a	20.8 bc	7.2 ab	0.8
Alpine Russet*	54.0 c	28.6 a	14.8 cde	2.0 ab	0.7
Blazer Russet	29.6 d	18.7 a	30.2 a	26.4 a	1.0
Owyhee Russet*	68.2 b	23.1 a	7.8 ef	0.6 ab	0.2
Tebina Russet	50.7 c	25.0 a	19.1 bc	4.5 ab	0.9
Yukon Gem*	52.5 c	26.1 a	17.6 bc	3.6 ab	0.3
Yukon Gold	30.8 d	20.9 a	31.8 a	19.1 a	0.6
Low N					
Norland	35.7 q	24.7	28.1 pq	12.6 pq	0.6
Blazer Russet	25.4 qr	22.3	32.9 p	21.1 pq	2.1
Tebina Russet	52.6 p	29.7	15.5 q	1.8 q	0.5
Yukon Gold	19.7 r	21.7	31.3 pq	34.8 p	1.8

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

* Varieties marked with an asterisk were planted as mini-tubers approximately 1 week after the other varieties.

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 71. In the regular N plots, Amarosa produced significantly greater yield of tubers under 4 oz. and tubers 4 to 6 oz. than all other varieties. Tebina Russet produced the greatest yield of 6 to 10 oz. tubers but was not statistically different from Yukon Gold, Blazer Russet, Terra Rosa and Norland. Norland produced the highest yield of tubers over 10 oz. although only statistically greater than

Amarosa with no tubers in this category. There were no statistically significant differences in the deformed size category from regular N plots.

In the low N plots, Tebina Russet produced the greatest yield of tubers under 4 oz. and 4 to 6 oz. Yukon Gold produced a significantly higher yield of tubers over 10 oz. than Tebina Russet or Norland. There were no statistically significant differences between varieties when yields of 6 to 10 oz. and deformed tubers were evaluated. Yukon Gold produced significantly lower yields of tubers under 4 oz. and 6 to 10 oz. when grown in low N plots than in regular N plots. Norland produced a significantly lower yield of tubers over 10 oz. when grown on low N compared to regular N.

Table 71: Estimated yield (ton/ac) in each size category (< 4 oz., 4 to 6 oz., 6 to 10 oz., > 10 oz. and deformed) for each variety grown at full nitrogen (approximately 225 lbs./ac) and low nitrogen (approximately 115 lbs./ac). Varieties marked with an asterisk were planted as mini-tubers later than other varieties. Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS - 2011	Yield of < 4 oz. (ton/ac)	Yield of 4 to 6 oz. (ton/ac)	Yield of 6 - 10 oz. (ton/ac)	Yield of > 10 oz. (ton/ac)	Yield of deformed (ton/ac)
Regular N					
A99326-1PY*	9.9 b	5.6 bcd	3.8 de	0.9 ab	0.2
Amarosa	13.4 a	13.4 a	0.3 f	0.0 b	0.0
Norland	2.4 e	3.2 de	6.2 abcde	9.5 a	0.4
Red Sunset*	5.9 cd	5.9 bcd	4.0 cde	1.6 ab	0.1
Terra Rosa	5.2 de	4.4 bcde	7.3 abc	3.6 ab	0.4
Alpine Russet*	6.0 cd	6.8 b	5.4 cde	1.1 ab	0.3
Blazer Russet	2.1 e	2.3 e	6.5 abcd	7.4 a	0.3
Owyhee Russet*	9.2 bc	5.1 bcde	2.6 ef	0.4 ab	0.1
Tebina Russet	8.8 bc	3.8 cde	9.5 a	3.4 ab	0.6
Yukon Gem*	6.2 cd	6.0 bc	5.9 bcde	1.8 ab	0.3
Yukon Gold	2.8 e	3.9 cde	9.3 ab	8.4 a	0.3
Low N					
Norland	2.3 q	3.1 q	5.5	3.7 qr†	0.1
Blazer Russet	1.9 q	2.6 q	6.6	6.3 pq	0.6
Tebina Russet	9.5 p	10.5 p	7.9	1.3 r	0.3
Yukon Gold	1.4 q†	3.0 q	6.6†	9.6 p	0.4

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

* Varieties marked with an asterisk were planted as mini-tubers approximately 1 week after the other varieties.

Varieties were evaluated for several other quality parameters during the grading process including uniformity of shape, uniformity of size and eye depth. The results of these subjective

assessments are presented in Table 72. There were no significant differences between varieties grown at CDCS in terms of uniformity or eye depth.

Table 72: Uniformity of shape, uniformity of size, and eye depth ratings for each variety grown at full nitrogen (approximately 225 lbs./ac at CDCS). Varieties marked with an asterisk were planted as mini-tubers later than other varieties. Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS - 2011	Uniformity of Shape	Uniformity of Size	Eye Depth
Regular N			
A99326-1PY*	3.0	3.3	3.0
Amarosa	3.0	3.0	3.0
Norland	3.0	3.0	3.0
Red Sunset*	3.0	3.0	3.0
Terra Rosa	3.0	3.0	3.0
Alpine Russet*	3.0	3.0	3.0
Owyhee Russet*	3.3	3.3	4.0
Tebina Russet	2.0	2.7	3.0
Yukon Gem*	3.0	3.0	3.3
Yukon Gold	3.0	3.0	3.3

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

* Varieties marked with an asterisk were planted as mini-tubers approximately 1 week after the other varieties.

Tuber samples used to measure specific gravity were evaluated for hollow heart (HH), brown centre (BC), stem-end discoloration (SED), other types of internal necrosis and scab. Subsamples of Amarosa, Alpine Russet, Norland, Owyhee Russet, Red Sunset, and Tebina Russet were free of any internal defects. There were very few internal defects observed in the other varieties examined, except for Yukon Gold where stem-end discoloration was common and hollow heart and vascular discoloration were observed in at least one tuber of each subsample. Yukon Gem had brown centre in one tuber of two subsamples. Blazer Russet showed some evidence of hollow heart. A99326-1PY had anthocyanin present in the tubers (PP) of several subsamples, usually a variety characteristic. Terra Rosa had some stem-end discoloration and vascular discoloration (VD), possibly a result of immaturity at the time desiccant was applied. Yukon Gold was the only variety with common scab lesions present on one tuber.

Varieties were evaluated in the Food Science lab at CDCS for culinary quality. Data from the boil and bake evaluations is presented in Table 73.

Table 73: Culinary evaluations of each fresh market variety grown at full nitrogen (approximately 225 lbs./ac) at CDCS. Data shown is the mean of duplicate analyses of a composite sample.

Boiled Potatoes

CDCS - 2011	Flesh color	Waxiness†	Sloughing	After Cooking Discoloration
Regular N				
A99326-1PY*	deep yellow	3	none	none
Amarosa	purple	3	none	none
Norland	off-white	2	none	none
Red Sunset*	yellow	3	none	none
Terra Rosa	light purple	3	none	moderate
Alpine Russet*	off-white	3	none	none
Owyhee Russet*	off-white	4	none	none
Tebina Russet	yellow	3	none	none
Yukon Gem*	deep yellow	3	none	moderate
Yukon Gold	deep yellow	4	moderate	none

Baked Potatoes

CDCS	Flesh color	Texture*	After Cooking Discoloration
Regular N			
A99326-1PY*	deep yellow	3	none
Amarosa	deep purple	3	none
Norland	yellow	3	none
Red Sunset*	off-white	2	none
Terra Rosa	light purple	3	none
Alpine Russet*	off-white	3	none
Owyhee Russet*	deep yellow	4	none
Tebina Russet	yellow	3	none
Yukon Gem*	deep yellow	4	none
Yukon Gold	deep yellow	3	none

† Waxiness: 1 = very waxy (very clean cuts); 2 = waxy (clean cuts with some residue); 3 = slightly waxy (more mealy than waxy); 4 = not waxy (fluffy/mealy)

* Varieties marked with an asterisk were planted as mini-tubers approximately 1 week after the other varieties.

†† Texture: 1 = wet; 2 = slightly wet; 3 = slightly mealy; 4 = mealy

2012

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the full nitrogen rate (248 lbs/ac) was achieved through a combination of soil fertility (82 lbs./ac N; 192 lbs./ac P, 760 lbs./ac K), broadcast fertilizer (176 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting and broadcast fertilizer (279 lbs./ac 34-0-0) incorporated at hilling. Fertility for the medium nitrogen rate (150 lbs./ac) was achieved through a combination of soil fertility and broadcast fertilizer (176 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting. Fertility for the low nitrogen rate (90 lbs./ac) was achieved through a combination of soil fertility and broadcast fertilizer (100 lbs./ac of 11-52-0) incorporated prior to planting. Varieties were planted in four replicate rows in a randomized split block design (with fertility as the main block) along with standard varieties (Norland, Russet Norkotah, and Yukon Gold). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 10) to control weeds. Seed of standard cultivars was provided by Edmonton Potato Growers and seed of test cultivars was provided by each participant. Most varieties were planted May 23, 2012 approximately 5 to 5½"deep using a two-row tuber unit planter. Seed was planted at 30cm spacing in 6m rows spaced 90cm apart. Seed was cut (70 to 85 g) and suberized prior to planting.

The potatoes were hilled June 4 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 74). Insecticide was applied July 17 (Matador 120 EC, 40 mL/ac) and August 15 (Decis 5 EC, 50 mL/ac) to control Colorado potato beetle.

Table 74: Foliar fungicides applied to the potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
June 29	Bravo 500	0.64 L/ac
July 27	Ridomil Gold Bravo	883 mL/ac
Aug 15	Bravo 500	0.64 L/ac

Figure 39: Variety evaluation trial at CDCS in Brooks, AB July 20, 2012.

Reglone (1.4 L/ac) was applied September 13 to facilitate mechanical harvest. Tubers were harvested September 18-25 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 8˚C until graded. Tubers were graded into size categories (less than 48mm, 48 – 88mm, and over 88mm). A sample of twenty-five tubers (48 – 88mm) from each replicate was used to determine specific gravity using the weight in air over weight in water method. These tubers were cut longitudinally to assess internal defects. A composite sample of 8 tubers (2 per rep) was stored at 8˚C until culinary analyses were performed. Samples were evaluated for suitability for boiling and baking November 23, 2012.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request. Comparisons for specific cultivars at two rates of N were analyzed using t-tests on a cultivar-by-cultivar basis (Excel; $p \leq 0.05$).

Results and Discussion

Sample hills of each variety were dug for a field day August 22, 2012. Photos of these varieties are shown in Figure 40.

Figure 40. Fresh Market varieties at the CDCS field day August 22, 2012 (cultivars marked with an asterisk are from archives): a) EPG 007, b) PLP 005, c) Markies, d) Norkotah, e) Norland, f) Roko*, g) Sangre*, h) Yukon Gold, i) Amarosa, j) ASPI 003, k) ASPI 002*, l) SI 002, m) SI 003, n) SI 004, o) SI 001*, p) Red Sunset*, q) Terra Rosa, r) ASPI 001, and s) Yukon Gem

Yield data (total yield; ton/ac) and specific gravities of each of the fresh market cultivars are shown in Table 75. The highest total yield on regular N plots at CDCS was observed with SI 001. SI 001 yielded significantly more than all other fresh market cultivars at this level of N.

The highest total yield on moderate N at CDCS was observed with Norland. Total yield of CV99044-3 was statistically lower than that of Norland at 150 lbs./ac N.

Specific gravity of tubers grown on 248 lbs./ac ranged from 1.067 for SI 001 to 1.099 for Terra Rosa. There were no statistical differences in specific gravity between fresh market cultivars at this level of N. Specific gravity of tubers grown on 150 lbs./ac ranged from 1.071 for Norland to 1.102 for EPG 007 and CV99044-3. As expected, specific gravity of Amarosa on 100 lbs./ac plots was significantly higher than when grown on 248 lbs./ac N.

The trial was designed to provide regional data for a wide range of potato cultivars. Amarosa, CV99044-3, Markies, Russet Norkotah, Norland, Roko, Sangre, and Yukon Gold were grown on two rates of N. There were significant differences in total yield and/or specific gravity for Amarosa, CV99044-3, Roko and Yukon Gold as a result of different levels of N. Further addressing the agronomic needs of each cultivar may well result in improvements to yield and size profiles when compared to the results in this trial.

Table 75: Estimated total yield (ton/acre) and specific gravity for each variety grown at full nitrogen (approximately 248 lbs./ac), moderate nitrogen (approximately 150 lbs./ac) and low nitrogen (100 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2012 Fresh Market	Yield (ton/ac)	SG
Regular N		
Amarosa	17.0 f†	1.080 a†
ASPI 003	25.6 b-f	1.080 a
PLP 005	27.5 b-e†	1.091 a
ASPI 002	23.6 c-f	1.098 a
SI 002	26.8 b-f	1.077 a
SI 003	34.6 b	1.084 a
SI 004	27.9 bcd	1.073 a
Markies	23.4 c-f	1.086 a
Russet Norkotah	27.9 bcd	1.087 a
Norland	29.7 bcd	1.078 a
SI 001	46.5 a	1.067 a
Red Sunset	17.5 ef	1.073 a
Roko	29.3 bcd†	1.092 a
Sangre	23.7 c-f	1.087 a
Terra Rosa	22.1 def	1.099 a
ASPI 001	32.6 bc	1.088 a
Yukon Gem	34.8 b	1.078 a
Yukon Gold	28.4 bcd†	1.092 a
Moderate N		
EPG 007	25.8 ab	1.102 a
PLP 005	13.0 b†	1.102 a
Markies	18.3 ab	1.086 b
Russet Norkotah	24.0 ab	1.086 b
Norland	28.4 a	1.071 c
Roko	21.9 ab†	1.091 ab
Sangre	19.3 ab	1.083 bc
Yukon Gold	17.3 ab†	1.088 b
Low N		
Amarosa	4.13 b†	1.095 a†
Norland	23.32 a	1.083 b

† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

The mean percentage of total tuber number in each size category is shown in Table 76. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

The percentage of tuber count in each size category for fresh market cultivars is represented in Table 3. In the 248 lb./ac N plots, Amarosa, SI 002, SI 004, Markies and Terra Rosa produced a greater percentage of small tubers (< 48 mm) than medium tubers (48 – 88mm). CV99044-3 has similar percentages of small and medium tubers, and the remainder of cultivars produced more medium than small tubers. Yukon Gold, Yukon Gem, Sangre and Red Sunset had a significantly higher percentage of oversized tubers than other cultivars which may be an indication that these cultivars are early maturing and an earlier harvest date may be more appropriate. Yukon Gold had a significantly higher percentage of deformed tubers than all other cultivars, except ASPI 001 and may be related to growing past an optimal harvest date.

In moderate N plots, Amarosa, SI 002, SI 004, Markies and Terra Rosa produced a greater percentage of small tubers (< 48 mm) than medium tubers (48 – 88mm). Russet Norkotah and Roko produced similar percentage of small and medium tubers at this level of N. A small percentage of oversized tubers were produced by cultivars at this level of N in the trial. All of the tested cultivars, except Sangre and Russet Norkotah produced a smaller percentage of deformed tubers than Yukon Gold. Size distribution of Amarosa and Norland on 100 lbs./ac N plots was similar to the size profiles of these cultivars at other levels of N.

Significant differences in percentages of specific size categories were observed for CV99044-3, Norland, Russet Norkotah and Yukon Gold grown at different rates of N.

Table 76: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each variety grown at full nitrogen (approximately 248 lbs./ac), moderate nitrogen (approximately 150 lbs./ac) and low nitrogen (100 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2012	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Regular N				
Amarosa	99.0 a	0.4 d	0.3 bc	0.2 b
ASPI 003	25.5 ef	69.2 a	3.0 bc	2.3 b
PLP 005	48.6 bcd†	49.4 abc†	0.6 bc	1.4 b
ASPI 002	35.9 de	61.5 ab	0.0 c	2.6 b
SI 002	63.8 b	33.8 bc	0.0 c	2.4 b
SI 003	34.4 def	60.5 abc	1.0 bc	4.1 b
SI 004	57.0 bc	41.7 abc	0.2 c	1.1 b
Markies	64.1 b	31.1 cd	0.1 c	4.6 b
Russet Norkotah	35.4 c-f	57.0 abc	2.1 bc†	5.4 b
Norland	23.6 ef	66.5 a†	2.7 bc	2.1 b
SI 001	36.7 c-f	57.5 abc	2.0 bc	3.8 b
Red Sunset	37.9 cde	56.9 abc	3.7 abc	1.6 b
Roko	47.8 bcd	50.0 abc	0.0 c	2.3 b
Sangre	30.9 def	62.7 abc	3.6 abc	2.8 b
Terra Rosa	63.2 b	34.4 bc	0.0 c	2.4 b
ASPI 001	29.2 ef	63.3 ab	1.8 bc	5.7 ab
Yukon Gem	31.9 def	60.8 abc	4.7 ab	2.6 b
Yukon Gold	15.1 f†	64.6 ab	7.8 a†	12.5 a
Moderate N				
EPG 007	33.2 cd	64.0 ab	1.3 abc	1.4 bc
PLP 005	61.0 ab†	38.6 de†	0.0 c	0.6 c
Markies	68.9 a	27.7 e	0.0 c	3.4 bc
Russet Norkotah	47.0 bc	46.5 cd	0.6 bc†	5.9 ab
Norland	24.1 d	71.6 a†	2.9 ab	1.4 bc
Roko	53.6 ab	43.8 cd	0.0 c	2.6 bc
Sangre	35.2 cd	57.8 abc	2.7 ab	4.2 abc
Yukon Gold	35.3 cd†	53.0 bcd	3.3 a†	8.4 a
Low N				
Amarosa	100.0 a	0.0 b	0.0 b	0.0 b
Norland	27.4 b	67.5 a	1.3 a	3.9 a

† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 77. In the regular N plots, Amarosa yielded significantly more potatoes less than 48 mm than most cultivars, but was not significantly different from SI 002, SI 004 or Terra Rosa. Marketable

yield ranged from 0.2 ton/ac of Amarosa to 32.7 ton/ac of SI 001. SI 001 yielded significantly more marketable tubers than Yukon Gold or Norland (checks) in this trial, but was not statistically different from Russet Norkotah, SI 003, Yukon Gem or ASPI 001.

At the moderate rate of N, Markies produced a significantly greater yield of small tubers compared to two check varieties, Yukon Gold and Norland. Yield of marketable tubers (48 – 88mm) ranged from 7.7 ton/ac for CV99044-3 to 22.6 ton/ac for Norland.

N level had a significant impact on the yield of small Amarosa tubers, where a greater yield of small tubers was harvested from the regular N plots than from the moderate N plots. Significantly higher yield of marketable CV99044-3 tubers were produced on 248 lbs./ac N than 150 lbs./ac N plots. On 150 lbs./ac plots, significantly lower yield of oversized Russet Norkotah and Yukon Gold tubers were produced compared to the higher rate of N. No significant impact of N level was observed for yield of deformed tubers.

Table 77: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each variety grown at full nitrogen (approximately 248 lbs./ac), moderate nitrogen (approximately 150 lbs./ac) and low nitrogen (100 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2012	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Regular N				
Amarosa	16.7 a†	0.2 f	0.0 a	0.1 a
ASPI 003	2.4 c	20.2 b-e	2.2 a	0.8 a
PLP 005	7.1 bc	19.2 b-e†	8.7 a	12.0 a
ASPI 002				
SI 002	11.5 ab	14.2 b-e	0.0 a	1.1 a
SI 003	4.7 bc	26.4 ab	1.3 a	2.2 a
SI 004	9.2 abc	17.8 b-e	0.4 a	0.6 a
Markies	7.7 bc	13.3 cde	0.1 a	2.2 a
Russet Norkotah	3.5 bc	20.4 a-e	2.3 a†	1.7 a
Norland	6.4 bc	20.0 b-e	2.4 a	9.5 a
SI 001	7.3 bc	32.7 a	3.2 a	3.4 a
Red Sunset	2.5 c	12.6 def	1.9 a	0.5 a
Roko	7.4 bc	19.3 b-e	0.0 a	2.6 a
Sangre	2.7 c	17.2 b-e	2.8 a	1.1 a
Terra Rosa	9.8 abc	11.6 ef	0.0 a	0.8 a
ASPI 001	2.4 c	25.6 abc	2.3 a	2.3 a
Yukon Gem	4.0 bc	24.7 a-d	4.8 a	1.3 a
Yukon Gold	4.5 bc†	13.0 de	6.4 a†	4.4 a
Moderate N				
EPG 007	3.5 abc	20.6 a	1.083 abc	0.6 ab
PLP 005	5.1 abc	7.7 b†	0.00 c	0.2 b
Markies	7.9 a	8.7 b	0.00 c	1.7 ab
Russet Norkotah	5.3 abc	15.6 ab	0.7 bc†	2.4 a
Norland	2.6 bc	22.6 a	2.7 a	0.5 ab
Roko	7.3 ab	13.7 ab	0.00 c	0.9 ab
Sangre	2.5 c	13.9 ab	1.7 abc	1.2 ab
Yukon Gold	2.3 c	10.8 b	2.1 ab†	2.2 ab
Low N				
Amarosa	4.1 a†	0.0 b	0.0 b	0.0 b
Norland	2.4 b	18.3 a	1.0 a	1.6 a

† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

A comparison of medium potatoes (48 – 88mm) for the three cultivars grown on regular and moderate N plots is shown in Figure 41.

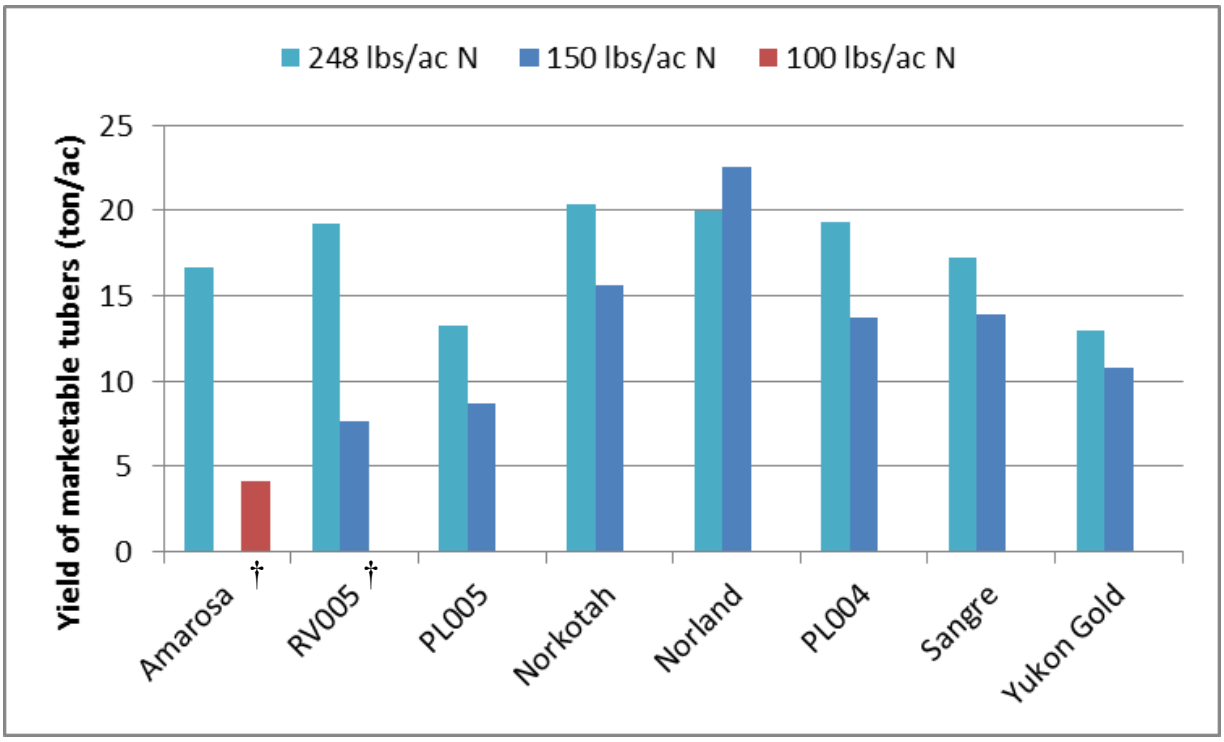

Figure 41: Yield (yon/ac) of marketable potatoes (< 48 mm for Amarosa and 48 – 88mm for others) produced on regular (248 lbs./ac) N, moderate (150 lbs./ac) N and low (100 lbs./ac) N plots. Each variety marked with † are statistically different ($p \leq 0.05$).

Tubers were assessed subjectively for Uniformity of Size and Overall Appearance. Scores are presented in Table 78. At the regular rate of N, no significant differences in Uniformity of Shape were observed. Amarosa scored highest for Uniformity of Size, but was only significantly different from Red Sunset, Yukon Gem and ASPI 001. For Overall Appearance, SI 001 scored significantly higher than Yukon Gold, Red Sunset, Roko and Terra Rosa. At the moderate rate of N, EPG 007 and Russet Norkotah scored highest for Uniformity of Shape and were significantly different from Roko. There were no significant differences in Uniformity of Size or Overall Appearance at this level of N.

Table 78: Subjective tuber assessments. Uniformity of Size was subjectively assessed on each replicate by the same individual during the grading process. Overall Appearance was based on uniformity of size and uniformity of shape, skin colour, deformities and eye depth. Data shown is the mean of 4 replicates.

2012	Uniformity of Shape[1]	Uniformity of Size[2]	Overall Appearance[3]
Regular N			
Amarosa	4.0 a	4.0 a	3.8 ab
ASPI 003	2.5 a	2.3 ab	2.8 ab
PLP 005	3.5 a	3.5 ab	3.5 ab
ASPI 002			
SI 002	3.3 a	3.3 ab	3.3 ab
SI 003	3.5 a	2.8 ab	3.3 ab
SI 004	3.5 a	3.3 ab	3.3 ab
Markies	2.8 a	2.5 ab	3.0 ab
Russet Norkotah	4.0 a	3.3 ab	3.0 ab
Norland	3.0 a	2.4 ab	3.0 ab
SI 001	4.3 a	3.5 ab	4.3 a
Red Sunset	2.5 a	2.0 b	2.5 b
Roko	2.5 a	2.3 ab	2.5 b
Sangre	3.0 a	2.5 ab	3.0 ab
Terra Rosa	2.5 a	2.5 ab	2.5 b
ASPI 001	3.0 a	2.0 b	2.8 ab
Yukon Gem	3.0 a	2.0 b	3.0 ab
Yukon Gold	2.8 a	2.5 ab	2.5 b
Moderate N			
EPG 007	3.8 a	3.3 a	3.8 a
PLP 005	3.3 ab	3.7 a	3.3 a
Markies	3.0 ab	3.0 a	3.5 a
Russet Norkotah	3.8 a	3.0 a	3.3 a
Norland	3.2 ab	2.8 a	3.2 a
Roko	2.0 b	2.8 a	2.5 a
Sangre	2.8 ab	2.3 a	3.0 a
Yukon Gold	2.8 ab	2.3 a	3.5 a
Low N			
Amarosa	4.0	4.0	3.0
Norland	3.0	3.0	3.0

[1]Uniformity of Shape: 1 (very variable) - 5 (very uniform)
[2] Uniformity of Size: 1 (very variable) - 5 (very uniform)
[3] Overall Appearance: 1 (very poor) - 5 (outstanding)
† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

Tuber samples used to measure specific gravity were also evaluated for hollow heart, brown center, stem-end discoloration, other types of internal necrosis and scab. There were few internal defects noted for most cultivars grown at 248 lbs./ac N. Roko and SI 003 have a tendency toward internal pigmentation. Several varieties showed low levels of stem end discoloration, possibly as a result of vine maturity at the time of top-killing.

There were few internal defects noted for the varieties grown at 150 lbs./ac N or 100 lbs./ac N. Several varieties had a small percentage of tubers with stem end discoloration, possibly as a result of vine maturity at the time of top-killing. Very few other internal defects were noted.

Cultivars were evaluated in the Food Science lab at CDCS for culinary quality. Data from the boil and bake evaluations are presented in Table 79A and B. After cooking darkening was not noted for any of the varieties after boiling or baking. When grown at 248 lbs./ac N, ASPI 002 and Yukon Gold displayed severe sloughing in the boiled potato evaluations, while Amarosa, ASPI 003, SI 002, Norland, SI 001, Red Sunset, Roko and Terra Rosa had none. Of the cultivars evaluated, Amarosa, SI 004, SI 001 and Red Sunset were the waxiest and ASPI 002, Russet Norkotah, Terra Rosa, ASPI 001 and Yukon Gold the mealiest after boiling. When baked, SI 002, SI 004, Russet Norkotah and Red Sunset were rated as slightly wet textured while Yukon Gold was mealiest.

When grown at 150 lbs./ac N, only Russet Norkotah displayed severe sloughing in the boiled potato evaluations. Norland and Sangre were rated as waxy after boiling, while Russet Norkotah and Yukon Gold were rated as fluffy/mealy. Most cultivars were rated as slightly wet after baking, while Russet Norkotah was rated as slightly mealy.

Table 79: A) Culinary evaluations of each fresh market variety grown on full nitrogen (approximately 248 lbs./ac), moderate nitrogen (approximately 150 lbs./ac) and low nitrogen (100 lbs./ac). Data shown is the mean of duplicate analyses of a composite sample.

Boiled Potatoes

2012	Waxiness†	Sloughing£	After Cooking* Discoloration
Regular N			
Amarosa	2	3	3
ASPI 003	3	3	3
ASPI 002	4	1	3
SI 002	3	3	3
SI 003	3	2	3
SI 004	2	2	3
Russet Norkotah	4	2	3
Norland	3	3	3
SI 001	2	3	3
Red Sunset	2	3	3
Roko	3	3	3
Sangre	3	2	3
Terra Rosa	4	3	3
ASPI 001	4	2	3
Yukon Gem	3	2	3
Yukon Gold	4	1	3
Moderate N			
Markies	3	3	3
Russet Norkotah	4	1	3
Norland	2	2	3
Roko	3	3	3
Sangre	2	3	3
Yukon Gold	4	2	3
Low N			
Amarosa	2	3	3
Norland	2	3	3

† Waxiness: 1 = very waxy (very clean cuts); 2 = waxy (clean cuts with some residue); 3 = slightly waxy (more mealy than waxy); 4 = not waxy (fluffy/mealy); £Sloughing: 1 = severe; 2 = moderate; 3 = none; *After-cooking Discoloration: 1 = severe; 2 = moderate; 3 = none.

Table 79. B) Culinary evaluations of each fresh market variety grown on full nitrogen (approximately 248 lbs./ac), moderate nitrogen (approximately 150 lbs./ac) and low nitrogen (100 lbs./ac). Data shown is the mean of duplicate analyses of a composite sample.

Baked Potatoes

2012	Flesh color	Texture*	After Cooking Discoloration*
Regular N			
Amarosa	Red	3	3
ASPI 003	White	3	3
ASPI 002	White		
SI 002	Yellow	2	3
SI 003	Yellow	3	3
SI 004	Yellow	2	3
Russet Norkotah	White	2	3
Norland	White	3	3
SI 001	Off-white	3	3
Red Sunset	White	2	3
Roko	White	3	3
Sangre	White	3	3
Terra Rosa	Red	3	3
ASPI 001	White	3	3
Yukon Gem	Yellow	3	3
Yukon Gold	Yellow	4	3
Moderate N			
Markies	Yellow	2	3
Russet Norkotah	White	3	3
Norland	White	2	3
Roko	White	2	3
Sangre	White	2	3
Yukon Gold	Yellow	2	3
Low N			
Amarosa	Red	2	3
Norland	White	2	3

*** Texture: 1 = wet; 2 = slightly wet; 3 = slightly mealy; 4 = mealy; *After-cooking Discoloration: 1 = severe; 2 = moderate; 3 = none.**

2013

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the full nitrogen rate (235 lbs/ac) was achieved through a combination of soil fertility (124 lbs./ac N; 361 lbs./ac P, 1930 lbs./ac K), broadcast fertilizer (165 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting and broadcast fertilizer (132 lbs./ac 34-0-0) incorporated at hilling. Fertility for the reduced nitrogen rate (190 lbs./ac) was achieved through a combination of soil fertility and broadcast fertilizer (165 lbs./ac of 34-0-0 and 100 lbs./ac of 11-52-0) incorporated prior to planting. Varieties were planted in four replicate rows in a randomized split block design (with fertility as the main block) along with standard varieties (Norland and Yukon Gold). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 6) to control weeds. Seed of standard cultivars was provided by Edmonton Potato Growers and seed of test cultivars was provided by each participant. Seed was cut (70 to 85 g), if necessary, and suberized prior to planting. Potatoes were planted May 23, 2013 approximately 5 to 5½"deep using a two-row tuber unit planter. Seed was planted at 30cm spacing in 6m rows spaced 90cm apart.

The potatoes were hilled June 17 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 80). Insecticide was applied July 10 (Matador 120 EC, 40 mL/ac) to control Colorado potato beetle.

Table 80: Foliar fungicides applied in 2013 to the potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
July 10	Quadris	202 mL/ac
July 20	Bravo 500	0.64 L/ac
Aug 15	Ridomil Gold Bravo	883 mL/ac

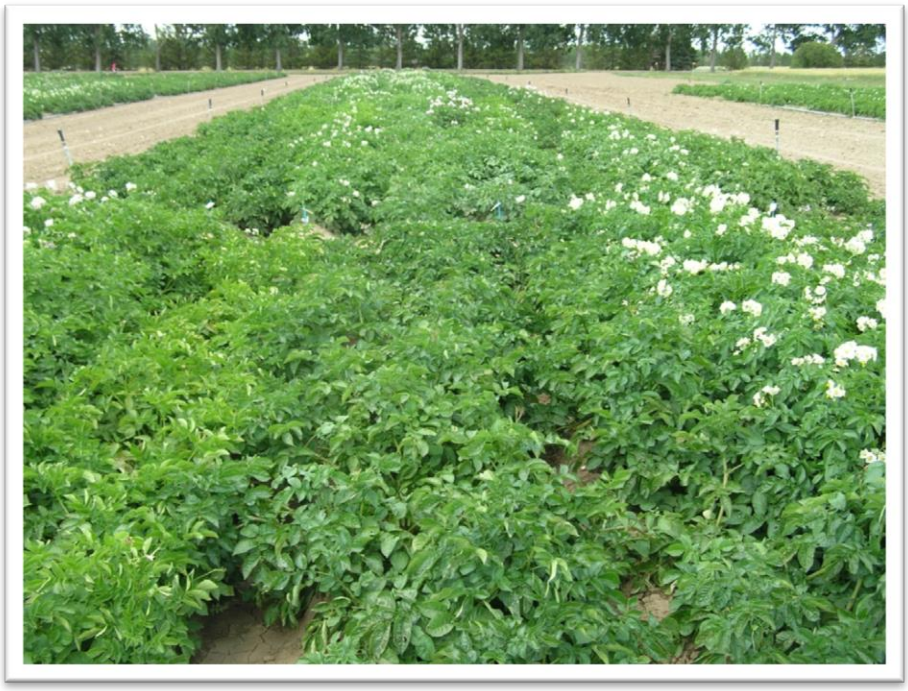

Figure 42: Variety evaluation trial at CDCS in Brooks, AB July 30, 2013.

Reglone (1.4 L/ac) was applied September 11 to facilitate mechanical harvest. Tubers were harvested September 23-24 with a one-row Grimme harvester for yield and grade data.

Tubers were stored at 8˚C until graded. Tubers were graded into size categories (less than 48mm, 48 – 88mm, over 88mm and deformed). A sample of twenty-five tubers (48 – 88mm) from each replicate was used to determine specific gravity using the weight in air over weight in water method. These tubers were cut longitudinally to assess internal defects.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request. Comparisons for specific cultivars at two rates of N were analyzed using t-tests on a cultivar-by-cultivar basis (Excel; $p \leq 0.05$).

Results and Discussion

Sample hills of each variety were dug for a field day August 22, 2013. Photos of these varieties are shown in Figure 43.

Figure 43. Fresh Market varieties at the CDCS field day August 22, 2013: a) Yukon Gold, b) SI004, c) SI002, d) RV006, e) SI001, f) TT003, g) Almera, h) PLP 005, i) Penta, j) Norland, k) SI003, l) TT005 and m) Roko.

Yield data (total yield; ton/ac) and specific gravities of each of the fresh market cultivars are shown in Table 81. The highest total yield on regular N plots at CDCS was observed with SI001. SI001 yielded significantly more than all other fresh market cultivars at this level of N. Both SI002 and RV006 yielded significantly more than Yukon Gold (yellow-fleshed check). SI004 and SI003 both yielded less than their respective check varieties, however, it should be noted that seed piece decay was evident at planting for both of these cultivars. This may have resulted from holding seed until all other trial entries were provided and is not an indication of the true potential of the cultivars.

The highest total yield on moderate N at CDCS was observed with Almera. Total yield of Roko, Norland, Penta, TT003 and RV006 were not statistically different from one another, but less than that of Almera. Total yield of PLP 005 was significantly greater than total yield of Yukon Gold (check).

Specific gravity of tubers grown on 235 lbs./ac ranged from 1.060 for SI001 to 1.078 for SI002, Yukon Gold and SI003. These values are consistent with specific gravity typical of other fresh market cultivars.

Specific gravity of tubers grown on 190 lbs./ac ranged from 1.064 for Almera to 1.088 for Roko. The specific gravities of Almera, RV006 and TT003 were significantly lower than that of Yukon Gold (check), but not statistically different from Norland. The specific gravities of PLP 005, Penta, Roko and TT005 were not statistically different from that of Yukon Gold (check) under these conditions.

The trial was designed to provide regional data for a wide range of potato cultivars. Norland, Yukon Gold and RV006 were grown at both rates on N. There was no significant difference in total yield or specific gravity for these varieties as a result of different levels of N. The N rate in the moderate N plots was approximately 45 lbs./ac lower than the regular rate. The N rates may not have been sufficiently different to impact yield and specific gravity of all cultivars tested. Further addressing the agronomic needs of each cultivar may well result in improvements to yield and size profiles when compared to the results in this trial.

Table 81: Estimated total yield (ton/acre) and specific gravity for each variety grown at full nitrogen (approximately 235 lbs./ac) and moderate nitrogen (approximately 190 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2013 Fresh Market	Yield (ton/ac)	SG
Regular N		
SI004	21.0 c	1.063 bc
SI002	30.4 b	1.078 a
RV006	30.5 b	1.069 b
Yukon Gold	20.0 c	1.078 a
SI001	45.1 a	1.060 c
SI003	16.8 c	1.078 a
Norland	32.4 b	1.070 b
Moderate N		
TT003	34.41 bc	1.069 cd
Almera	46.72 a	1.064 d
PLP 005	26.53 c	1.078 bc
RV006	34.06 bc	1.069 cd
Penta	31.99 bc	1.081 ab
Yukon Gold	19.55 d	1.080 ab
Norland	33.42 bc	1.069 cd
TT005	22.15 d	1.074 bcd
Roko	38.53 b	1.088 a

† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

The mean percentage of total tuber number in each size category is shown in Table 82. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19mm in diameter. This tended to increase the yield of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

The percentage of tuber count in each size category for fresh market cultivars is represented in Table 3. In the 235 lb./ac N plots, the majority of tubers for each variety fell into the marketable category (48 – 88mm). Norland, Yukon Gold and SI001 had a significantly higher percentage of oversized tubers than other cultivars which may be an indication that these cultivars are early maturing and an earlier harvest data may be more appropriate. SI003 had a significantly higher percentage of deformed tubers than the other cultivars and may be related to the seed condition at planting.

In moderate N plots, Almera yielded a significantly lower percentage of small (< 48mm) tubers than most of the other varieties tested, but not statistically less than Yukon Gold, Norland or TT003. Both PLP 005 and TT005 produced a significantly higher percentage of small tubers

than other cultivars. In the marketable category (48 – 88mm), Roko produced the highest percentage of marketable tubers and the percentage of marketable tubers produced by Almera, TT003, Penta, RV006, Yukon Gold and Norland were not statistically different. The percentage of marketable tubers from TT005 was significantly lower than Roko and several other varieties, but not significantly lower than Yukon Gold, Norland or PLP 005. A small percentage of oversized tubers were produced by many cultivars in the trial. Norland, Yukon Gold and Almera produced the highest percentage of oversized tubers likely because these are early maturing varieties and the trial was harvested in September. TT003, PLP 005, RV006, and Penta produced a smaller percentage of oversized tubers than Yukon Gold (check). TT005 and Roko produced a significantly smaller percentage of oversized tubers than Norland. All of the tested cultivars produced a smaller percentage of deformed tubers than Yukon Gold, but the percentage of deformed tubers for these cultivars was not statistically different than that of Norland.

No significant differences in size profile were observed for Norland, Yukon Gold and RV006 grown at different rates of N.

Table 82: Percentage of total tuber number in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed) for each variety grown at full nitrogen (approximately 235 lbs./ac) and moderate nitrogen (approximately 190 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2013	No. of <48mm	No. of 48 to 88mm	No. of > 88mm	No. of deformed
Regular N				
SI004	40.5 a	57.5 ab	1.3 d	0.5 b
SI002	43.5 a	56.0 ab	0.0 d	0.5 b
RV006	30.0 abc	66.8 a	2.5 cd	1.3 b
Yukon Gold	24.0 bc	60.5 ab	11.3 abc	4.5 b
SI001	20.8 c	64.0 a	15.5 a	0.0 b
SI003	37.3 ab	48.5 b	4.5 bcd	9.8 a
Norland	25.5 ab	58.8 ab	12.3 ab	3.5 b
Moderate N				
TT003	20.3 cde	71.0 ab	6.5 bc	2.5 b
Almera	13.3 e	75.3 ab	10.8 ab	0.8 b
PLP 005	41.5 ab	57.3 bc	1.3 c	0.3 b
RV006	32.0 bc	65.3 ab	2.0 c	0.8 b
Penta	28.5 cd	67.0 ab	2.8 c	1.3 b
Yukon Gold	18.0 de	61.8 abc	14.5 a	6.5 a
Norland	18.5 de	61.3 abc	17.8 a	3.0 ab
TT005	51.5 a	47.3 c	0.3 c	1.0 b
Roko	19.0 de	76.3 a	3.0 c	2.0 b

† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 83. In the regular N plots, SI002 yielded significantly more potatoes under 48 mm than other cultivars. Marketable yield ranged from 9.9 ton/ac of SI003 to 27.5 ton/ac of SI001. SI001, RV006, SI002 and SI004 all yielded significantly more marketable than Yukon Gold (check) in this trial. Norland yielded significantly more marketable tubers than SI003. SI003 yielded more deformed tubers than the other test cultivars, but was not significantly different from either check in this category.

At the moderate rate of N, Penta, PLP 005, RV006 and TT005 produced a significantly greater yield of small tubers compared to both check varieties, Yukon Gold and Norland. Yield of marketable tubers (48 – 88mm) ranged from 11.26 ton/ac for Yukon Gold to 33.86 ton/ac for Almera. Marketable yield of Almera and Roko were statistically greater than that of both check varieties. Marketable yield of TT005 was significantly lower than many of the cultivars tested, but was not statistically different from either check. The greatest yield of oversized tubers was observed for early varieties, Norland, Almera and Yukon Gold, likely resulting from the timing of harvest for the trial. TT005 and Roko produced statistically lower yields of oversized tubers relative to Norland. The yield of oversized TT003, Almera, PLP 005, RV006 and Penta tubers were not statistically different from that of Yukon Gold. There were no statistical differences in the yield of deformed tubers produced by the varieties in this trial.

N level had a significant impact on the yield of small Yukon Gold tubers, where a greater yield of small tubers was harvested from the regular N plots than from the moderate N plots. No significant impact of N level was observed for yield by size category of RV006 or Norland.

Table 83: Estimated yield (ton/ac) in each size category (< 48mm, 48 to 88mm, > 88mm, and deformed tubers) for each variety grown at full nitrogen (approximately 235 lbs./ac) and moderate nitrogen (approximately 190 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

2013	Yield of <48mm (ton/ac)	Yield of 48 to 88mm (ton/ac)	Yield of > 88mm (ton/ac)	Yield of deformed (ton/ac)
Regular N				
SI004	3.9 b	15.8 cd	1.1 c	0.2 b
SI002	6.6 a	23.6 ab	0.2 c	0.3 b
RV006	3.9 b	24.2 ab	1.9 bc	0.5 b
Yukon Gold	1.2 c†	12.4 d	5.1 bc	1.4 ab
SI001	2.4 bc	27.5 a	15.1 a	0.2 b
SI003	2.1 bc	9.9 d	2.5 bc	2.3 a
Norland	2.0 bc	20.1 bc	8.5 b	1.7 ab
Moderate N				
TT003	1.85 cde	26.43 ab	5.35 b	0.78 a
Almera	1.62 de	33.86 a	10.85 a	0.36 a
PLP 005	4.94 ab	20.67 bc	1.21 b	0.12 a
RV006	4.27 ab	27.41 ab	2.00 b	0.37 a
Penta	3.51 bc	25.41 ab	2.50 b	0.57 a
Yukon Gold	0.61 e†	11.26 d	6.16 ab	1.52 a
Norland	1.34 de	19.36 bcd	11.20 a	1.52 a
TT005	5.61 a	15.69 cd	0.46 b	0.39 a
Roko	2.54 cd	31.58 a	2.94 b	1.47 a
EPG 006	1.9 c	23.7 bc	2.1 cd	0.5 a

† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

A comparison of medium potatoes (48 – 88mm) for the three cultivars grown on regular and moderate N plots is shown in Figure 44.

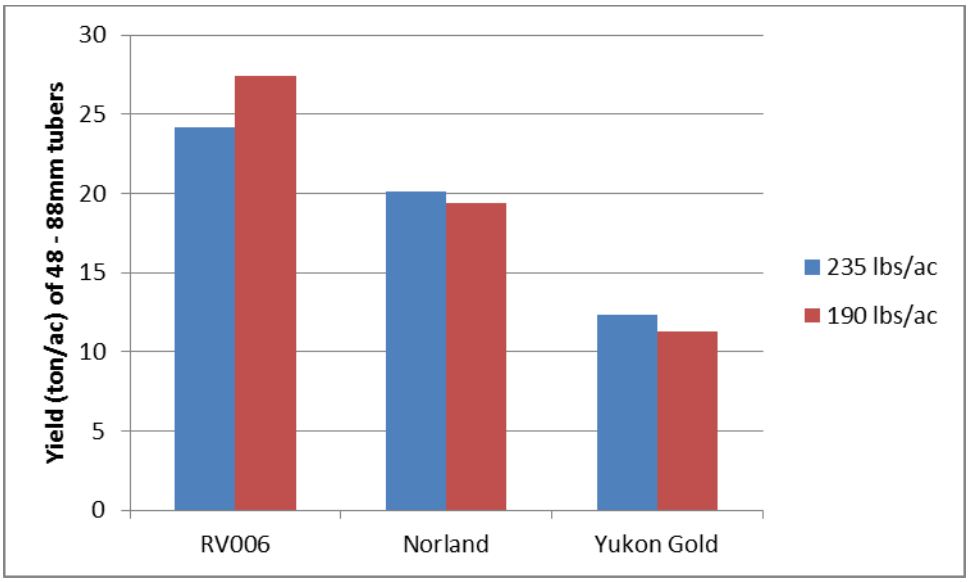

Figure 44: Yield (ton/ac) of potatoes (48 – 88mm) produced on regular (235 lbs./ac) N and moderate (190 lbs./ac) N plots. For each variety, yield columns marked with † are statistically different ($p \leq 0.05$).

Tubers were assessed subjectively for Uniformity of Size and Overall Appearance. Scores are presented in Table 84. At the regular rate of N, SI002 scored significantly better for uniformity of size than Yukon Gold. At the moderate rate of N, the two check varieties scored lower for Uniformity of Size and Overall Appearance than the other cultivars tested. Penta, PLP 005 and TT005 were scored as the most uniform of the cultivars evaluated. PLP 005, RV006, Penta and TT005 scored highest in terms of Overall Appearance at this level of N.

Table 84: Subjective tuber assessments: Uniformity of Size was subjectively assessed on each replicate by the same individual during the grading process. Overall Appearance was based on uniformity of size and uniformity of shape, skin colour, deformities and eye depth. Data shown is the mean of 4 replicates.

2013	Uniformity of Size[1]	Overall Appearance[2]
Regular N		
SI004	3.3 ab	3.8 a
SI002	3.5 a	3.0 ab
RV006	2.8 ab	3.8 a
Yukon Gold	2.0 b	2.8 ab
SI001	2.8 ab	3.8 a
SI003	2.5 ab	2.3 b
Norland	2.3 ab	2.5 ab
Moderate N		
TT003	3.00	3.00
Almera	2.75	3.00
PLP 005	3.75	4.00
RV006	3.25	3.75
Penta	3.75	3.75
Yukon Gold	2.00	2.00
Norland	2.25	2.00
TT005	3.50	3.50
Roko	3.00	3.00

[1] Uniformity of Size: 1 (very variable) - 5 (very uniform)
[2] Overall Appearance: 1 (very poor) - 5 (outstanding)
† Data between the regular and low N plots was statistically different at the $p \leq 0.05$ level.

Tuber samples used to measure specific gravity were also evaluated for hollow heart, brown centre, stem-end discoloration, other types of internal necrosis and scab. There were few internal defects noted for SI004, SI002, RV006, and SI001 grown at 235 lbs./ac N. Approximately 9% of SI003, 5% of Yukon Gold and 2% of the Norland tubers in the SG sample had hollow heart. Approximately 30% of the SI003 tubers had some level of pigmentation in the tubers flesh. Several varieties showed low levels of stem end discoloration, possibly as a result of vine maturity at the time of top-killing.

There were few internal defects noted for most of the varieties grown at 190 lbs./ac N. Approximately 8% of Yukon Gold tubers in the SG sample had hollow heart. Several varieties (Yukon Gold, Penta, Almera, Roko, PLP 005 and TT005) showed stem end discoloration, possibly as a result of vine maturity at the time of top-killing. Very few other internal defects were noted.

Cultivars were evaluated in the Food Science lab at CDCS for culinary quality. Data from the boil and bake evaluations are presented in Table 85A and B. After cooking darkening was not noted for any of the varieties after boiling or baking. When grown at 235 lbs./ac N, Yukon Gold displayed severe sloughing in the boiled potato evaluations, while RV006 and SI001 had none. Of the cultivars evaluated, SI001 was the waxiest and Yukon Gold the mealiest after boiling and baking.

When grown at 190 lbs./ac N, none of the cultivars displayed severe sloughing in the boiled potato evaluations. Norland, Almera, PLP 005 and RV006 were rated as waxy after boiling, while TT003, TT005 and Roko were only slightly wet. Yukon Gold and Penta were rated as mealier after boiling. Most cultivars were rated as slightly mealy after baking, while Penta, PLP 005 and Almera were rated as slightly wet. RV006 was rated as mealy after baking.

Table 85: A) Culinary evaluations of each fresh market variety grown at a regular rate of nitrogen (235 lbs./ac) at CDCS). Data shown is the mean of duplicate analyses of a composite sample.

Boiled Potatoes

CDCS - 2013	Flesh color	Waxiness†	Sloughing	After Cooking Discoloration
Regular N				
SI004	Yellow	3	Moderate	None
SI002	Yellow	2	Moderate	None
RV006	Yellow	3	None	None
Yukon Gold	Yellow	4	Severe	None
SI001	Off-white	1	None	None
SI003	Yellow	2	Moderate	None
Norland	White	1	None	None
Moderate N				
TT003	Yellow	2	Moderate	None
Almera	Yellow	1	None	None
PLP 005	Off-white	1	Moderate	None
RV006	Deep Yellow	1	None	None
Penta	Yellow	4	Moderate	None
Yukon Gold	Yellow	3	Moderate	None
Norland	White	1	None	None
TT005	White	2	Moderate	None
Roko	Off-white	2	Moderate	None

† Waxiness: 1 = very waxy (very clean cuts); 2 = waxy (clean cuts with some residue); 3 = slightly waxy (more mealy than waxy); 4 = not waxy (fluffy/mealy)

Table 85. B) Culinary evaluations of each fresh market variety grown at a moderate rate of nitrogen (190 lbs./ac) at CDCS). Data shown is the mean of duplicate analyses of a composite sample.

Baked Potatoes

CDCS - 2013	Flesh color	Texture*	After Cooking Discoloration
Regular N			
SI004	Deep Yellow	1	None
SI002	Deep Yellow	1	None
RV006	Deep Yellow	2	None
Yukon Gold	Yellow	3	None
SI001	Yellow	1	None
SI003	Deep Yellow	4	None
Norland	Off-white	2	None
Moderate N			
TT003	Yellow	3	None
Almera	Deep Yellow	2	None
PLP 005	Off-white	2	None
RV006	Deep Yellow	4	None
Penta	Deep Yellow	2	None
Yukon Gold	Yellow	3	None
Norland	Off-white	3	None
TT005	Off-white	3	None
Roko	Yellow	3	None

* Texture: 1 = wet; 2 = slightly wet; 3 = slightly mealy; 4 = mealy

Conclusions

The 2011 variety trial included a number of fresh market potato varieties with potential in Alberta. Norland and Yukon Gold were included in the trial as check varieties for varieties graded into weight categories. Yield of tubers produced from mini-tubers was disappointing and sizes tended to be smaller than for other varieties. A russet skinned standard was not included in the first year of the trial. Some of the novel varieties included yielded well. It is difficult to draw conclusions from such a range of varieties and intended uses. It may be necessary to evaluate some of these varieties again with appropriate standards and conventional seed.

For varieties graded into size categories, Norland, Dark Red Norland and Yukon Gold were included in the trial as check varieties. Yield of many of the test varieties compared well with familiar standard varieties. ASPI 002 is an impressive oblong white potato. ASPI 001 is a uniform, attractive oblong russet skinned variety. Several of the red-skinned varieties are attractive with yields comparable to the red standards. Solanum 001 is a high-yielding yellow-fleshed variety. Solanum 002 and Tuberosum 003 may have potential as creamer varieties. For

all varieties except Tuberosum 003, there was a trend toward higher total yield in the regular N plots (225 lbs./ac) than in the low N plots (115 lbs./ac). Fewer large tubers were observed from the low N plots than from the regular N plots. There were very few internal defects observed in most of the tubers examined. Scab was only observed on one EPG variety.

For all varieties, there was a trend toward higher total yield in the regular N plots (225 lbs./ac) than in the low N plots (115 lbs./ac). Fewer large tubers were observed from the low N plots than from the regular N plots. There were very few internal defects observed in most of the tubers examined. The trial was designed to provide regional data for a wide range of potato cultivars. The N rate in the low N plots was over 100 lbs./ac lower than the regular rate. A rate of N that is intermediate may give better results than either full or low N. Addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

Results from the CDCN location indicated that higher fertility and irrigation typically resulted in greater yield. Addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

The 2012 variety trial included five fresh market cultivars with potential in Alberta and several check varieties, Norland, Russet Norkotah, and Yukon Gold. SI 001, ASPI 001, Yukon Gem and SI 003 were impressive in the 2012 evaluations for high total and marketable yield, good overall appearance and good boiling characteristics. SI 002, Amarosa, SI 004 and Markies yielded well in both the small potato and marketable potato categories indicating the potential usefulness in dual purpose (gourmet and table) markets.

The 2013 variety trial included five fresh market cultivars with potential in Alberta and two check varieties, Norland and Yukon Gold. SI001 and Almera were impressive in the 2013 evaluations for high total and marketable yield, good overall appearance and good boiling characteristics. SI002 yielded well in both the small potato and marketable potato categories indicating its potential usefulness in dual purpose (gourmet and table) markets. RV006, Penta and TT003 look like excellent potential replacements for Yukon Gold in the yellow fleshed market. Roko yielded very well and scored better than Norland for Uniformity of Size and Overall Appearance. TT005 and PLP 005 appear to be suited to a smaller potato market or a dual purpose potato with good yield of small and marketable sizes and good scores for Uniformity of Size and Overall Appearance. It was difficult to assess SI003 and SI004 fairly in this trial because seed quality at planting was questionable.

The trial was designed to provide regional data for a wide range of potato cultivars. Addressing the agronomic needs of each specific cultivar may well result in improvements to yield and size profiles when compared to the results in this year of the trial.

Creamer Variety Evaluation

2012

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the medium nitrogen rate of 145 lbs/ac N was achieved through a combination of soil fertility (74 lbs./ac N; 192 lbs./ac P, 760 lbs./ac K), broadcast fertilizer (175 lbs./ac of 34-0-0) incorporated prior to planting and broadcast fertilizer (100 lbs./ac of 11-52-0) incorporated at hilling. Fertility for the reduced nitrogen rate of 85 lbs./ac was achieved through a combination of soil fertility and broadcast fertilizer (100 lbs./ac of 11-52-0) incorporated prior to planting. Varieties were planted in four replicate rows in a randomized split block design (with fertility as the main block). Each block was planted adjacent to guard rows to reduce any edge effects.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 10) to control weeds. Seed of test cultivars was provided by each participant. Most varieties were planted May 23, 2012 approximately 5 to 5½"deep using a two-row tuber unit planter. Whole seed was planted at 15 cm spacing in 6 m rows spaced 90 cm apart.

The potatoes were hilled June 4 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 86). Insecticide was applied July 17 (Matador 120 EC, 40 mL/ac) and August 15 (Decis 5 EC, 50 mL/ac) to control Colorado potato beetle.

Table 86: Foliar fungicides applied to the 2012 potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
June 29	Bravo 500	0.64 L/ac
July 27	Ridomil Gold / Bravo	883 mL/ac
Aug 15	Bravo 500	0.64 L/ac

Figure 45: Variety evaluation trial at CDCS in Brooks, AB July 27, 2012.

Reglone (1.4 L/ac) was applied August 3 and re-applied (1.0 L/ac) August 12 to encourage skin set and facilitate mechanical harvest. Tubers were harvested September 4 & 5 with a one-row Checci harvester for yield and grade data.

Tubers were stored at 8˚C until graded. Tubers were graded into size categories (less than 25 mm, 25-41 mm, > 41 mm, and deformed). A 5 kg sample of (tubers 25-41 mm) from each replicate was used to determine specific gravity using the weight in air over weight in water method.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request.

Results and Discussion

Sample hills of each variety were dug for a field day at CDCS August 22, 2012. Photos of these varieties are shown in Figure 46.

Figure 46. Creamer varieties at the CDCS July 27, 2012: a) TT 011, b) TT 006, c) TT 007, d) LPC 012, e) LPC 010, f) LPC 013, g) TT 009, h) TT 008, i) LPC 014.

Yield data (total yield; ton/ac) and specific gravities of each of the releases are shown in Table 87. The highest total yield on medium N at CDCS was observed with LPC 012, and total yield of TT 011, TT 009 and TT 008 were not statistically less than that of LPC 012.

The highest total yield on low N was observed with LPC 012 and total yield of TT 011, TT 009, and TT 008 were not statistically different. Total yield of TT 011 was significantly greater from the medium fertility plots than from the low fertility plots at CDCS indicating that the low fertility rate was sub-optimal for yield. Total yield of other varieties was not significantly different between the two fertility levels. The trial was designed to provide regional data for a wide range of potato cultivars. The N rate in the low N plots was approximately 60 lbs./ac lower than the medium rate at CDCS. A rate of N that is intermediate may give better results than either full or low N. Further addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this trial.

Specific gravity of tubers ranged from 1.054 for TT 011 to 1.074 for LPC 013 (low N). Differences between varieties were fairly consistent at each level of N. Only LPC 013 showed a significant response to N, with the SG at medium N significantly higher than that at low N.

Table 87: Estimated total yield (ton/acre) and specific gravity for each variety grown on medium nitrogen (approximately 145 lbs./ac) and low nitrogen (approximately 85 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS - 2012	Yield (ton/ac)	SG
Medium N		
TT 011	17.72 a †	1.054 d
TT 006	11.24 bc	1.070 ab
TT 007	12.22 bc	1.057 d
LPC 012	18.62 a	1.064 bcd
LPC 010	8.45 c	1.069 abc
LPC 013	11.19 bc	1.074 a †
TT 009	15.35 ab	1.057 d
TT 008	15.16 ab	1.059 cd
LPC 014	7.12 c	1.070 ab
Low N		
TT 011	15.19 a †	1.054 c
TT 006	9.33 cde	1.068 a
TT 007	10.84 bcd	1.054 c
LPC 012	15.63 a	1.061 abc
LPC 010	8.68 de	1.063 ab
LPC 013	9.94 cde	1.066 a †
TT 009	14.13 ab	1.058 bc
TT 008	13.47 abc	1.063 ab
LPC 014	6.40 e	1.065 ab

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

The mean percentage of total tuber number in each size category is shown in Table 88. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 19mm in diameter. This tended to increase the yield (and percentage) of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field.

In the medium N plots, TT 006 produced a significantly higher number of potatoes in the small (< 25 mm) category than other varieties. In the 25 to 41 mm category, TT 006 produced more tubers than TT 011, TT 007 and LPC 014. TT 006 produced the fewest tubers over 41 mm, while TT 011, TT 007 and TT 009 produced the most. No significant differences were observed in the deformed category.

In the low N plots, TT 006 and TT 008 produced more tubers under 25 mm than other varieties, while TT 011 and LPC 010 produced the fewest small tubers. TT 008, LPC 013, TT 009, and

TT 006 produced the greatest number of tubers 25 to 41 mm and TT 011, LPC 010 and LPC 014 produced the fewest. TT 011, TT 007 and TT 009 produced the greatest number of tubers over 41 mm and TT 006 produced the fewest. There were no statistically significant differences in the deformed size categories from the low N plots. A significantly greater number of tubers over 41 mm was observed with LPC 013 from the medium N plots than from the low N plots.

Table 88: Percentage of total tuber number in each size category (< 25mm, 25 to 41mm, > 41mm, and deformed) for each variety grown on medium nitrogen (approximately 145 lbs./ac) and low nitrogen (approximately 85 lbs./ac). Data shown is the mean of four replicates. Data was analyzed as tuber number per acre. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS - 2012	< 25mm	25 to 41mm	> 41mm	Deformed
Medium N				
TT 011	8.4 b	45.7 c	35.4 a	10.5
TT 006	31.3 a	63.1 a	4.4 d	1.2
TT 007	8.4 b	53.9 bc	31.1 ab	6.6
LPC 012	13.6 b	64.0 abc	19.6 abc	2.9
LPC 010	10.6 b	66.7 abc	19.6 bcd	3.1
LPC 013	15.0 b	66.3 abc	18.0 abc†	0.7
TT 009	9.4 b	61.3 abc	27.1 a	2.2
TT 008	16.3 b	69.1 ab	13.8 abcd	0.7
LPC 014	12.7 b	64.7 bc	18.0 cd	4.7
Low N				
TT 011	6.8 c	52.5 d	38.5 ab	2.2
TT 006	25.2 a	68.8 ab	4.0 d	2.0
TT 007	10.1 bc	61.0 cd	25.8 abc	3.4
LPC 012	14.4 bc	65.8 bcd	17.1 bcd	2.7
LPC 010	7.5 c	59.5 d	30.1 abc	2.9
LPC 013	14.0 bc	71.6 abc	12.2 cd†	2.2
TT 009	9.7 bc	66.2 abc	22.9 a	1.1
TT 008	15.7 ab	71.1 a	11.3 cd	1.9
LPC 014	22.6 bc	63.2 d	11.9 d	2.3

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

The yield of tubers (estimated ton/ac) of each variety is shown by size category in Table 89. In the medium N plots, TT 006 produced significantly the greatest yield of small (< 25 mm) potatoes compared to all varieties except TT 008. TT 008 produced the greatest yield of 25 to 41 mm tubers, and yields of TT 006, LPC 012, and TT 009 were not significantly lower in this category. The greatest yield of tubers > 41 mm was observed with TT 011, TT 007, and TT 009 on medium N. The smallest yield of tubers > 41 mm was observed with TT 006, LPC 014, LPC 010, LPC 013 and TT 008. The greatest yield of misshapen tubers was observed with TT 011 on medium N, and significantly fewer deformed tubers were observed for TT 006, LPC 013 and TT 008.

In the low N plots, there were no statistical differences in yield of tubers in the < 25 mm or deformed categories. LPC 012 produced the greatest yield of potatoes 25 to 41 mm in diameter, but not statistically more than TT 008, TT 009, LPC 013, TT 006 or TT 011. The smallest yield of tubers > 41 mm was observed with TT 006, LPC 014, LPC 013, TT 008, LPC 010 and TT 007 on low N plots.

Few significant differences were observed between yields in specific size categories for varieties grown on medium and low N plots. The medium rate of N significantly increased the yield of small (< 25 mm) tubers for LPC 014, and tubers over 41 mm for LPC 013. The trial was designed to provide regional data for a wide range of potato cultivars. The N rate in the low N plots was approximately 60 lbs./ac lower than the medium rate at CDCS. A rate of N that is intermediate may give better results than either full or low N. Further addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this year of the trial.

Table 89: Estimated yield (ton/ac) in each size category (< 25mm, 25 to 41mm, > 41mm, and deformed tubers) for each variety grown on medium nitrogen (approximately 145 lbs./ac) and low nitrogen (approximately 85 lbs./ac). Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS - 2012	Yield of <25mm (ton/ac)	Yield of 25 to 41mm (ton/ac)	Yield of > 41mm (ton/ac)	Yield of deformed (ton/ac)
Medium N				
TT 011	0.29 b	5.35 cde	9.88 a	1.70 a
TT 006	1.24 a	8.52 abc	2.35 d	0.13 b
TT 007	0.25 b	4.72 de	6.41 abc	0.71 ab
LPC 012	0.59 b	9.93 ab	7.37 ab	0.54 ab
LPC 010	0.26 b	4.85 de	2.90 cd	0.26 ab
LPC 013	0.47 b	6.59 bcde	3.80 bcd †	0.14 b
TT 009	0.34 b	8.03 abcd	6.28 abc	0.45 ab
TT 008	0.69 ab	10.42 a	3.99 bcd	0.14 b
LPC 014	0.24 b †	3.80 e	2.68 cd	0.42 ab
Low N				
TT 011	0.21	5.23 bcd	9.00 a	0.32
TT 006	1.05	6.64 abc	1.32 c	0.26
TT 007	0.29	5.02 bcd	4.41 bc	0.46
LPC 012	0.59	8.87 a	5.57 b	0.39
LPC 010	0.18	3.89 d	4.28 bc	0.35
LPC 013	0.43	7.07 ab	2.23 c †	0.26
TT 009	1.61	7.42 ab	5.58 b	0.25
TT 008	0.65	8.64 a	3.28 bc	0.34
LPC 014	0.26 †	3.99 cd	1.89 c	0.19

† indicates significant differences between regular fertility and low fertility plots using a two-tailed t-test.

A comparison of medium potatoes (25 – 41 mm) for each variety from medium and low fertility plots is shown in Figure 47. Although some trends were evident, none of the yields in this size category were significantly different between N levels at the $p \leq 0.05$ level.

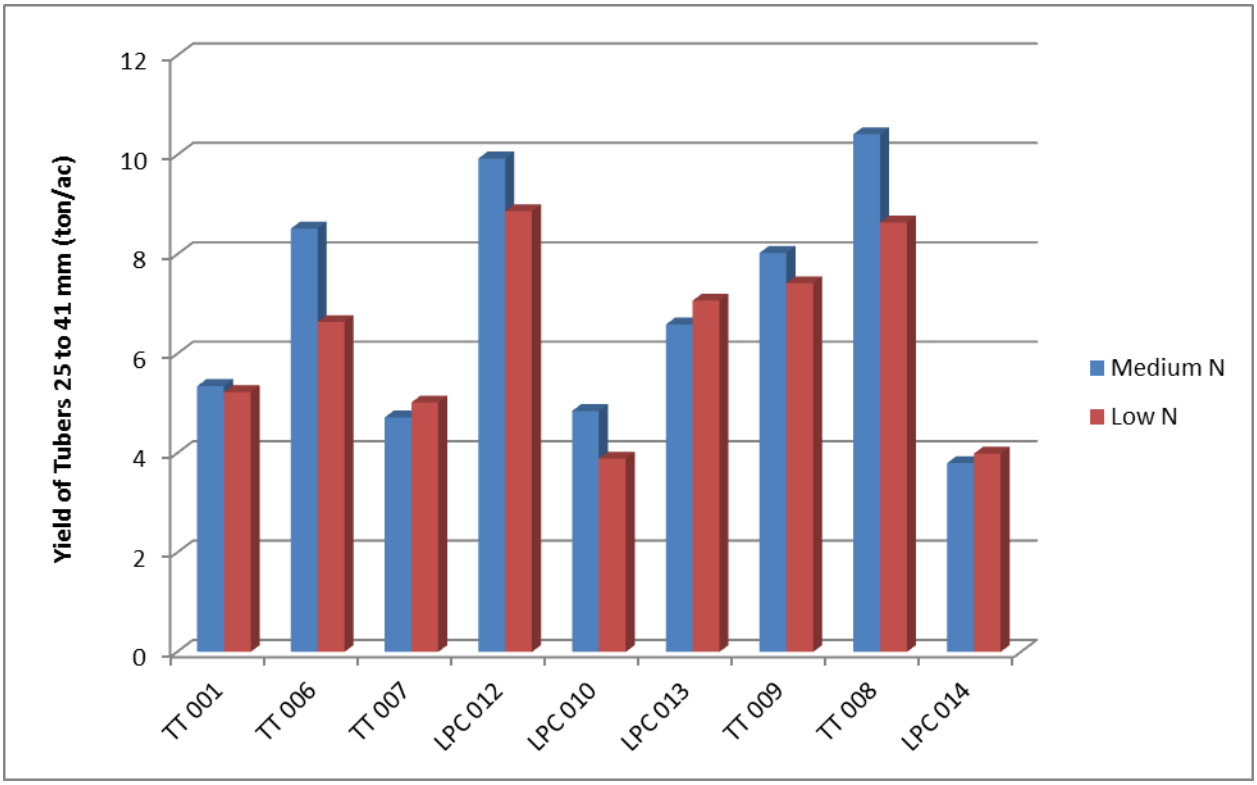

Figure 47: Yield of potatoes (25 – 41mm) produced on low (85 lbs./ac) and medium (145 lbs./ac) N at CDCS. None of the yields in this size category were significantly different between N levels at the $p \leq 0.05$ level.

2013

Materials and Methods

The variety evaluation was conducted in small plots at the Crop Diversification Centre South in Brooks, AB. Fertility for the low nitrogen rate of 135 lbs/ac N was achieved through a combination of soil fertility (124 lbs./ac N; 361 lbs./ac P, 1930 lbs./ac K) and broadcast fertilizer (100 lbs./ac of 11-52-0) incorporated prior to planting. Varieties were planted in four replicate rows in a randomized complete block design. Each block was planted adjacent to guard rows to reduce any edge effects. A fifth replicate of each variety was planted for in-season sampling and was not included in the yield calculations.

Eptam 8E (2.2 L/ac) and Sencor 75DF (150 g/ac) were applied pre-plant (May 6) to control weeds. Seed of test cultivars was provided by each participant. Whole seed was used for most cultivars, but when necessary seed was cut (70 to 85 g) and suberized prior to planting. The gourmet varieties were planted approximately 5 to 5½"deep using a two-row tuber unit planter June 7, 2013. In-row spacing was 15 cm spacing in 5 m rows spaced 90 cm apart.

The potatoes were hilled July 4 with a power hiller. The plots were irrigated to maintain soil moisture close to 70%. Foliar fungicides were applied several times during the growing season to prevent early and late blight from developing (Table 90). Insecticide was applied July 10 (Matador 120 EC, 40 mL/ac) to control Colorado potato beetle.

Table 90: Foliar fungicides applied to the 2013 potato crop to prevent early and late blight development.

Date of Application	***Fungicide***	***Rate***
July 10	Quadris	202 mL/ac
July 20	Bravo 500	0.64 L/ac
Aug 15	Ridomil Gold Bravo	883 mL/ac

Figure 48: LPC evaluation trial at CDCS in Brooks, AB July 30, 2012.

Emergence data was taken every two days following hilling. The Julian date when 50% of the plants had emerged was recorded and full emergence (100%) was recorded as the date when all plants expected to emerge had emerged. Stand was recorded once full emergence had been reached.

Reglone (1.4 L/ac) was applied September 11 to encourage skin set and facilitate mechanical harvest. Stem counts were taken following desiccation, just prior to harvest. The mean number of stems per plant was calculated by dividing the stand by the total number of stems in each row. The mean number of tubers per stem was calculated by dividing the total number of tubers from each row by the number of stems per row. Tubers were harvested September 23 & 24 with a one-row Checci harvester for yield and grade data.

Tubers were stored at 8˚C until graded. Tubers were graded into size categories (less than 25 mm, 25-41 mm, > 41 mm, and deformed). A 5 kg sample of (tubers 25-41 mm) from each replicate was used to determine specific gravity using the weight in air over weight in water method.

The data presented here have been statistically analyzed using ANOVA and Tukey's Multiple Comparison Test; (SPSS; $p \leq 0.05$). Statistical summaries are available upon request.

Sub-samples of tubers from the 25 – 41mm category were made available to the client for culinary evaluation. The results of the culinary evaluation will be provided independently of this report.

Results and Discussion

Sample hills of each cultivar were dug July 30, 2013 for an initial assessment of tuber set, yield potential and relative maturity. Photos of these potatoes are shown in Appendix B.

In season data is presented in Table 91. Approximately 19 days after planting, 50% of many of the plants in each row were visible (data not shown). Full emergence was reached between 23 and 32 days after planting. There was no significant difference in emergence dates from any of the cultivars planted. The mean number of stems per plant, tubers per stem and tubers per plant (tuber set) are shown in Table 2 as well. There were significant differences in each of these categories. For ease of comparison, cultivars have been grouped into categories by skin-color but were analyzed as a complete data set.

The mean number of tubers per plant ranged from as low as 8.7 for LPC 014 to as many as 46.9 for TT-10-014/2010-12. It is my understanding that a target of 15 or more tubers per plant is desirable for the production of gourmet potato varieties (Joel Vander Schaaf, personal communication). If tuber set is too high, however, many tubers may not reach a marketable size prior to harvest in Alberta's short growing season. Most of the cultivars included in the trial exceeded tuber sets of 15. Exceptions include the splash cultivars, LPC 013 and G12, the yellow cultivars G16, G7, and TT 009, red-skinned cultivars TT 007, LPC 012, G1, TT-09-060/2010-02 and TT-10-106/2011-07 and the purple-skinned cultivars LPC 014, G13, LPC 010, and TT-09-200-2010-04. As tuber set is only an indication, marketable yield will be a better indicator than tuber set alone for the potential of these cultivars as gourmet varieties.

Table 91: Field data and tuber set information for each variety grown at 135 lbs./ac N at CDCS. Data shown is the mean of three or four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS	Full Emergence DAP	Stems per Plant	Tubers per Stem	Tubers per Plant
Moderate N				
G12	27.3	3.5 cd	2.9 def	9.9 gh
LPC 013	31.8	3.5 cd	2.6 def	10.8 gh
425/09-06	31.0	8.0 a	3.3 def	26.3 b-f
G16	23.5	3.3 cd	6.6 a-e	14.1 fgh
G14	27.3	5.3 abcd	2.9 def	15.6 e-h
TT 006	24.8	5.7 abcd	3.0 def	17.1 d-h
G6	26.0	4.2 bcd	3.7 def	15.4 e-h
G7	28.5	4.3 bcd	3.0 def	12.5 gh
TT 009	27.3	5.3 abcd	3.9 def	14.7 fgh
G11	25.5	6.8 ab	2.4 ef	16.1 e-h
TT-08-024/2010-06	29.0	3.3 cd	6.5 a-e	21.2 b-g
TT-08-024/2010-07	27.7	4.4 bcd	1.8 b-f	19.8 c-h
TT-08-024/2010-12	27.7	5.2 abcd	6.1 a-f	32.2 b
TT-10-014/2010-06	27.7	3.9 bcd	7.3 a-d	27.1 b-e
TT-10-014/2010-12	27.7	4.9 abcd	10.0 a	46.9 a
TT 007	28.5	2.9 d	4.4 b-f	12.4 gh
LPC 012	27.7	5.2 abcd	2.9 def	14.7 fgh
G15	27.3	3.7 bcd	3.3 def	15.6 e-h
G1	27.3	4.8 bcd	2.8 def	13.4 gh
TT-08-006/2010-05	27.3	3.8 bcd	4.1 c-f	15.6 e-h
TT-09-060/2010-02	27.7	4.1 bcd	3.0 def	12.2 gh
TT-10-106/2011-07	29.3	4.1 bcd	3.6 def	12.2 gh
TT-10-106/2011-09	29.3	3.9 bcd	5.9 a-f	20.7 b-h
TT-10-125/2011-03	27.7	3.6 cd	9.1 ab	30.5 bc
TT-10-125/2011-05	27.7	3.2 cd	8.7 abc	27.9 bcd
G13	29.5	3.6 cd	3.2 def	10.8 gh
LPC 010	29.8	3.7 bcd	3.1 def	11.3 gh
LPC 014	27.7	5.7 abcd	1.6 f	8.7 h
TT-09-200/2010-01	29.3	6.3 abc	2.3 ef	16.4 d-h
TT-09-200/2010-04	29.0	5.7 abcd	2.2 ef	11.7 gh
TT-10-106/2011-04	27.7	5.0 abcd	3.3 def	16.2 d-h

Yield data (total yield; ton/ac) and specific gravities of each of the gourmet cultivars are shown in Table 92. Total yield estimates ranged from 7.0 ton/ac to 29.9 ton/ac. In order for producers to achieve a realistic return on investment growing gourmet potatoes, yield must be above a threshold. Of the bicolour potatoes, G12 yielded significantly more than LPC 013. Many of the yellow-skinned cultivars yielded well and were not significantly different from total yield of TT 006. TT 009, G6, G7, TT-08-024/2010-12, G16, 425/09-06, G14 and TT-10-014/2010-12 were among the best yielding yellow-skinned cultivars. Of these, G6 and TT 009 yielded significantly more than TT 006. TT 007, LPC 012, G15, G1, TT-08-006/2010-05, TT-09-060/2010-02 and TT-10-106/2011-09 were among the best yielding red-skinned cultivars, but none yielded significantly more than TT 007. Yields of purple-skinned cultivars were lower than yields of most other cultivars, with the exception of LPC 010, a yellow-fleshed cultivar. It is not clear whether yields are lower as a consequence of a shorter breeding and selection history, or if the production of anthocyanins in the tuber flesh is a significant sink for photosynthate with a corresponding impact on yield. Among the purple-skinned, purple-fleshed cultivars, the best yield was observed with TT-10-106/2011-04 although total yield was not statistically different from other purple-skinned entries. Further addressing the specific agronomic needs of each variety may well result in improvements to yield and size profiles when compared with the results in this trial.

Specific gravity of tubers ranged from 1.066 for TT 007 to 1.097 for 425/09-06 (Table 3). The texture of 'new' potatoes often associated with gourmet size is consistent with specific gravity values of 1.06 to 1.08. Varieties with specific gravities above 1.085 often rival those of French fry varieties with a dry or mealy texture and may be less suitable for the gourmet market.

Potatoes were sized into categories and the estimated number of tubers per acre in each size category is represented in Table 93. There were statistically significant differences in all size categories. For the bicolour potatoes, G12 produced significantly more tubers per acre in the > 41mm category than LPC 013, perhaps an indication of earlier maturity. Among the yellow-skinned potatoes, TT-10-014/2010-12 and TT-08-024/2010-12 produced significantly more 25 – 41mm tubers per acre than TT 006 and other yellow-skinned cultivars. None of the other tested lines produced significantly fewer tubers in this category than TT 006. G7 and TT 009 produced significantly more tubers in the > 41mm category than TT 006 and other cultivars, indicating that an earlier harvest of these potatoes may be required. TT-08-006/2010-05, TT-10-106/2011-09, TT-10-125/2011-03 and TT-10-125/2011-05 all produced significantly more tubers in the 25 – 41mm category than TT 007. Blushing Bell, however, produced the greatest number of tubes in the > 41mm category indicating that an earlier harvest of this cultivar may be preferred. The number of tubers over 41mm from G15 was not statistically different from that of TT 007 and G1, TT-09-060/2010-02 and TT-10-106/2011-09 also had a large number of tubers in the larger category. Both TT-10-106/2011-04 and TT-09-200/2010-01 produced high numbers of 25 – 41mm tubers per acre, however, there were no purple-skinned cultivars that produced significantly different numbers of tubers per acre in this size category than LPC 014. LPC 010 produced significantly more > 41mm tubers than LPC 014 and TT-09-200/2010-01 produced significantly fewer.

Table 92: Estimated total yield (ton/acre) and specific gravity for each variety grown at 135 lbs./ac N at CDCS. Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS	Yield (ton/ac)	SG
Moderate N		
G12	23.1 a-g	1.075 abc
LPC 013	8.38 hi	1.088 abc
425/09-06	20.2 a-g	1.097 a
G16	28.0 abc	1.070 bc
G14	19.3 a-h	1.082 abc
TT 006	17.8 c-i	1.080 abc
G6	29.9 a	1.067 c
G7	29.2 abc	1.081 abc
TT 009	29.8 a	1.080 abc
G11	13.6 f-i	1.084 abc
TT-08-024/2010-06	18.8 a-h	1.087 abc
TT-08-024/2010-07	15.8 e-i	1.083 abc
TT-08-024/2010-12	19.8 a-h	1.089 abc
TT-10-014/2010-06	18.3 b-i	1.096 a
TT-10-014/2010-12	20.8 a-g	1.080 abc
TT 007	27.0 a-d	1.066 c
LPC 012	29.3 ab	1.083 abc
G15	20.5 a-g	1.080 abc
G1	24.1 a-f	1.075 abc
TT-08-006/2010-05	21.1 a-g	1.080 abc
TT-09-060/2010-02	19.6 a-h	1.079 abc
TT-10-106/2011-07	7.0 i	1.082 abc
TT-10-106/2011-09	19.2 a-h	1.084 abc
TT-10-125/2011-03	13.3 f-i	1.079 abc
TT-10-125/2011-05	17.8 c-i	1.088 abc
G13	14.5 f-i	1.074 abc
LPC 010	26.9 a-e	1.084 abc
LPC 014	15.5 f-i	1.075 abc
TT-09-200/2010-01	12.0 ghi	1.073 abc
TT-09-200/2010-04	12.6 f-i	1.082 abc
TT-10-106/2011-04	16.5 d-i	1.095 ab

Table 93: Number of tubers per acre (x 1000) in each size category (< 25mm, 25 to 41mm, > 41mm, and deformed) for each variety grown at 135 lbs./ac N at CDCS. Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS	< 25mm	25 to 41mm	> 41mm	Deformed
Moderate N				
G12	18.9 hi	76.0 lm	169.3 b-g	0.9 b
LPC 013	32.3 hi	141.2 i-m	64.5 h-m	0.9 b
425/09-06	206.8 cd	398.4 cd	61.5 i-m	3.0 b
G16	47.2 hi	222.6 e-m	101.2 f-l	8.3 ab
G14	46.8 hi	201.7 f-m	171.8 efg	1.6 b
TT 006	52.4 hi	250.7 d-k	147.9 f-i	10.6 ab
G6	34.4 hi	183.0 f-m	195.8 def	2.7 b
G7	18.4 hi	99.6 klm	201.5 a-d	1.1 b
TT 009	28.8 hi	211.3 e-m	286.6 cde	0.6 b
G11	178.5 c-g	232.3 e-l	4.7 l	18.0 a
TT-08-024/2010-06	98.3 d-i	309.1 c-h	146.0 g-j	2.7 b
TT-08-024/2010-07	135.5 c-h	262.3 d-k	105.2 ijk	4.2 b
TT-08-024/2010-12	220.6 cd	566.6 ab	73.4 kl	6.9 ab
TT-10-014/2010-06	238.0 c	371.1 cde	117.5 jkl	5.1 b
TT-10-014/2010-12	593.3 a	643.0 a	25.8 l	2.1 b
TT 007	8.3 i	66.5 m	242.2 a	3.1 b
LPC 012	59.1 ghi	181.7 f-m	148.7 fgh	6.0 b
G15	24.3 hi	97.6 klm	204.4 a-d	0.9 b
G1	20.9 hi	129.7 j-m	204.2 bcd	1.8 b
TT-08-006/2010-05	76.4 f-i	301.1 c-i	36.4 kl	7.6 ab
TT-09-060/2010-02	22.5 hi	114.5 klm	180.5 bcd	3.9 b
TT-10-106/2011-07	113.3 c-i	153.2 h-m	43.8 jkl	4.2 b
TT-10-106/2011-09	72.2 f-i	290.2 d-j	180.8 f-i	0.6 b
TT-10-125/2011-03	462.9 b	319.6 c-f	28.5 l	11.4 ab
TT-10-125/2011-05	194.0 c-f	458.1 bc	90.5 jkl	2.4 b
G13	54.6 ghi	183.5 f-m	37.2 jkl	10.1 ab
LPC 010	4.9 i	72.2 lm	210.9 ab	11.0 ab
LPC 014	15.0 hi	106.4 klm	111.8 def	1.8 b
TT-09-200/2010-01	81.2 e-i	209.9 e-m	88.7 h-k	1.8 b
TT-09-200/2010-04	35.1 hi	155.9 f-m	113.3 f-i	0.0 b
TT-10-106/2011-04	38.7 hi	229.6 e-m	167.0 fgh	2.1 b

The mean percentage of total tuber number in each size category is shown in Table 94. It is important to note that harvesting with small plot equipment and manual labour recovers all potatoes over 15mm in diameter. This tended to increase the yield (and percentage) of small potatoes relative to a commercial situation where more of these tubers may be left behind in the field. The percentage of tubers in each category gives an indication of which cultivars require the full season to reach their potential and which may be earlier maturing. Approximately half of the trial entries reached marketable sizes well before the harvest date. Grouping cultivars into early and medium-maturing groups may prove a more effective tool for variety evaluation and selection in future.

Table 94: Percentage of total tuber number in each size category (< 25mm, 25 to 41mm, > 41mm, and deformed) for each variety grown at 135 lbs./ac N at CDCS. Data shown is the mean of four replicates.

CDCS	< 25mm	25 to 41mm	> 41mm	Deformed
Moderate N				
G12	7.1	28.6	64.0	0.3
LPC 013	7.4	59.1	27.1	0.4
425/09-06	30.8	59.6	9.2	0.4
G16	12.4	58.4	27.2	2.1
G14	11.0	48.2	40.6	0.4
TT 006	10.7	54.1	3.3	2.2
G6	5.6	43.4	48.0	0.6
G7	1.8	30.9	63.1	0.4
TT 009	5.5	40.1	54.7	0.1
G11	41.4	53.4	1.1	4.2
TT-08-024/2010-06	17.2	56.0	26.3	0.5
TT-08-024/2010-07	27.4	50.8	21.1	0.7
TT-08-024/2010-12	24.7	66.0	8.5	0.8
TT-10-014/2010-06	32.4	50.3	16.6	0.6
TT-10-014/2010-12	47.0	51.0	1.9	0.2
TT 007	2.6	20.9	75.6	1.0
LPC 012	8.0	45.9	37.6	1.5
G15	7.4	29.7	62.6	0.3
G1	6.0	36.7	56.9	0.5
TT-08-006/2010-05	17.8	71.9	8.5	1.9
TT-09-060/2010-02	3.9	35.3	56.6	1.2
TT-10-106/2011-07	35.8	49.0	13.9	1.3
TT-10-106/2011-09	13.3	53.5	33.1	0.1
TT-10-125/2011-03	56.1	38.9	3.5	1.4
TT-10-125/2011-05	26.3	61.3	12.0	0.3
G13	19.0	64.8	13.3	3.6
LPC 010	13.6	24.3	70.4	3.6
LPC 014	6.3	45.0	48.0	0.8
TT-09-200/2010-01	21.3	54.7	23.6	0.5
TT-09-200/2010-04	11.7	52.2	36.2	0.0
TT-10-106/2011-04	8.9	52.4	38.2	0.5

The estimated yield of tubers in each category is represented in Table 95. In general, a good yield of tubers in the 25 – 41mm category would be the focus of cultivar evaluation, but, in this trial, a good yield of tubers over 41mm may also indicate that an earlier harvest may result in an increased yield of 25 to 41 mm tubers. Several yellow-skinned cultivars had good yields of 25 to 41mm tubers. TT-10-014/2010-12, TT-08-024/2010-12, 425/09-06 and G16 yielded well and were not significantly different from TT 006. Yields of tubers > 41mm of G6, G7, TT 009, TT-09-060/2010-02 and G16 indicated that an earlier harvest may have been beneficial. For the red-skinned cultivars, G1 and TT-10-125/2011-05 showed promise with yields of 25 – 41mm tubers not significantly different from LPC 012 and TT 006. Higher yields of TT 007, LPC 012, G15, G1 and TT-10-106/2011-09 in the > 41mm category indicate that these cultivars may have been harvested too late. None of the purple-skinned cultivars stood out with good yields in the 25 – 41mm category and none were significantly different from LPC 014. Yields of TT-10-106/2011-04 and TT-09-200/2010-04 were reasonably good and not significantly different from that of LPC 014. LPC 010 yielded significantly more deformed tubers than most other cultivars regardless of skin colour, possibly as a result of harvesting past an optimal harvest date. G11 and G16 had yields of deformed tubers that were not statistically different from that of LPC 010 or any other cultivars. Optimizing harvest dates from each variety would allow a better evaluation of the yield potential within a desirable size range.

Table 95: Estimated yield (ton/ac) in each size category (< 25mm, 25 to 41mm, > 41mm, and deformed tubers) for each variety grown at 135 lbs./ac N at CDCS. Data shown is the mean of four replicates. Data followed by the same letter in each column of the table are not significantly different at the $p < 0.05$ level.

CDCS	Yield of <25mm (ton/ac)	Yield of 25 to 41mm (ton/ac)	Yield of > 41mm (ton/ac)	Yield of deformed (ton/ac)
Moderate N				
G12	0.19 hi	2.5 ef	20.2 a-d	0.18 b
LPC 013	0.30 hi	3.7 ef	4.4 j-m	0.05 b
425/09-06	2.33 c	12.6 a-d	4.7 i-m	0.66 b
G16	0.67 f-i	12.2 a-d	14.0 b-h	1.05 ab
G14	0.35 hi	6.1 b-f	12.7 d-j	0.11 b
TT 006	0.45 g-i	7.8 a-f	9.1 f-m	0.45 b
G6	0.36 hi	7.1 a-f	22.2 abc	0.26 b
G7	0.20 hi	4.7 def	24.2 a	0.15 b
TT 009	0.23 hi	6.6 b-f	22.9 ab	0.05 b
G11	2.39 c	9.7 a-f	0.5 m	0.98 ab
TT-08-024/2010-06	0.80 e-i	8.7 a-f	9.3 f-m	0.13 b
TT-08-024/2010-07	1.14 d-h	6.9 a-f	7.6 g-m	0.23 b
TT-08-024/2010-12	1.75 cde	13.7 abc	4.2 j-m	0.28 b
TT-10-014/2010-06	1.84 cd	9.3 a-f	7.0 g-m	0.20 b
TT-10-014/2010-12	4.72 a	14.4 ab	1.6 lm	0.05 b
TT 007	0.08 i	2.3 f	24.4 a	0.29 b
LPC 012	0.77 f-i	9.3 a-f	18.3 a-e	0.86 b
G1	0.20 hi	10.4 a-f	13.3 c-i	0.18 b
G15	0.20 hi	3.1 ef	17.2 a-f	0.05 b
TT-08-006/2010-05	1.35 d-g	15.1 a	4.2 j-m	0.50 b
TT-09-060/2010-02	0.17 hi	3.4 ef	15.6 a-g	0.47 b
TT-10-106/2011-07	0.83 e-i	3.6 ef	2.3 klm	0.23 b
TT-10-106/2011-09	0.61 f-i	7.6 a-f	10.9 e-k	0.03 b
TT-10-125/2011-03	3.45 b	7.8 a-f	1.7 lm	0.33 b
TT-10-125/2011-05	1.46 c-f	10.8 a-e	5.4 h-m	0.10 b
G13	0.70 f-i	9.0 a-f	3.9 j-m	0.85 b
LPC 010	0.05 i	2.4 f	22.5 ab	2.02 a
LPC 014	0.17 hi	3.5 ef	11.6 d-j	0.17 b
TT-09-200/2010-01	0.64 f-i	5.4 c-f	5.8 h-m	0.13 b
TT-09-200/2010-04	0.35 hi	4.2 def	8.0 g-m	0.00 b
TT-10-106/2011-04	0.33 hi	6.0 b-f	10.0 e-l	0.10 b

Conclusions

The 2012 variety trial included nine gourmet potato varieties with potential in Alberta. TT 008, TT 009 and TT 006 have desirable profiles for the yellow gourmet potato market. LPC 013 has an excellent size profile for the gourmet category and has a novel appearance. This variety seemed less prone to defects, and a reduced rate of N resulted in fewer oversized tubers. The blue potato varieties in this trial were unimpressive in appearance and yield and differences observed were not statistically significant. Fingerling varieties, such as TT 011 and LPC 012, likely need to be harvested earlier to maximize gourmet sizes and limit oversize potatoes.

The 2013 variety trial included thirty-one gourmet potato varieties with potential in Alberta. The splash-skinned cultivar, G12 out-yielded LPC 013 and has an attractive and interesting appearance. A number of yellow-skinned cultivars showed promise and rivaled TT 006 in yield, size profile and appearance. Several additional yellow-skinned cultivars had impressive yields of tubers in the >41mm category and may need to be harvested earlier for a meaningful evaluation. Red-skinned TT-08-006/2010-05 showed promise as a fingerling and several other red-skinned varieties, such as G15, G1, and TT09-060/2010-02 may need a closer look and an earlier harvest date. One purple-skinned cultivar, TT-10-106/2011-04, showed promise in appearance, size profile and yield relative to other purple-skinned cultivars.

The trial was designed to provide regional data for a wide range of potato cultivars. A N response curve for each variety is not realistic based on two levels of N, but these results should provide an indication of whether additional N will result in a shift in size categories that is desirable. In 2012, the N rate in the low N plots was 60 lbs./ac lower than the regular rate. In 2013, the N rate of 135 lbs./ac was a moderate rate of N relative to processing cultivars, but possibly higher than required for some of the gourmet potato cultivars. Addressing the agronomic needs of each variety may well result in improvements to yield and size profiles when compared to the results in this year of the trial.

Overall Results

Over the three years of the Alberta Potato Variety Evaluation trial, Alberta data was provided for 132 cultivars from the AAFC National Potato Breeding Program. The cultivars comprised 26 chipping clones, 24 French fry or dual purpose clones, and 82 fresh market clones including clones with anti-oxidant properties, low glycaemic index and other novel attributes.

The French fry industry supplied 22 French fry cultivars for evaluation over three years, the chipping industry evaluated 26 cultivars, 39 cultivars were evaluated for stakeholders pursuing the fresh market segment, and 40 creamer potato cultivars were evaluated along with relevant check varieties. Many of the entries were grown at two different levels of N to provide preliminary agronomic data for stakeholders. As requested, some harvest dates were adjusted to accommodate clients. Some in-row spacing changes were made for specific categories of potatoes. After harvest and grading each year, potatoes were provided to cooperators to allow them to conduct bruising, storage and culinary evaluations independently.

Conclusions

The potato variety evaluation trial was well supported by the Alberta potato industry. Almost all of the key stakeholders participated in one or more years of the trial and many participated in every year of the trial. There has been interest expressed in continuing this type of variety evaluation work to ensure impartial information is available to decision makers throughout the value-chain.

One of the most interesting things we noted about the three-year trial is that there were examples of AAFC material included in 2011 that was picked up by industry in 2012 and 2013. Some of the industry entries in all three years of the trial originated from the federal program and within the space of three years, seed supplies are being established and commercial production of the new releases is anticipated. These cultivars have been identified throughout the report with a maple leaf. This type of flow-through and the engagement of all links in the value chain is the kind of positive outcome we hoped to achieve.

With a suitable land base and equipment and facilities required for potato production and evaluation, a knowledgeable coordinator and a skilled technical staff could routinely evaluate cultivars on behalf of industry stakeholders. The Alberta potato industry members have demonstrated a willingness to cooperate and provide funding to ensure access to relevant data continues in Alberta.

The framework of this trial formed the basis for an application to the Growing Forward 2 Science Cluster for potato variety evaluation work. The project has received funding for an additional 4 years from this source. Eight stakeholders plus the Potato Growers of Alberta provided letters of support for the new project.

References

Love, SL, R. Novy, D. Corsini, and P. Bain. 2003. Variety Selection and management. In: Potato Production Systems (J.C. Stark and S.L. Love, eds.). University of Idaho Agricultural Communications, Moscow, ID. pp: 21-47.

Westermann, D.T. 1993. Fertility management. In: Potato Health Management (R.C. Rowe, ed.). APS Press, St. Paul, MN. pp: 77-86.

Presentations

The potato industry will have access to the project information in many ways. Growers and industry members were invited to see the varieties at field days in Edmonton (Crop Diversification Centre North) and Brooks (Crop Diversification Centre South) in August 2011, August 2012 and August 2013. Dr. Konschuh spoke at the North Area Meeting of the Potato Growers of Alberta about the trial and opportunities for potato industry stakeholders to participate in 2011 and 2012. In Brooks, guests were invited to tour the evaluation plots and compare the unique performances of each variety in the field under local conditions.

Data was collected, analyzed and presented in multiple reports to industry stakeholders each year of the trial. Each sponsor was provided with a client-specific report for each year of participation. Information will be available on the internet (ARD website, PVMI website and PGA website) for easy access for growers.

Some modifications were made to the trial each year at the request of participants. Where possible, excess production was made available to partners for storage and culinary evaluations.

Posters were presented at the Annual General Meeting of the Potato Growers of Alberta in 2011, 2012 and 2013.

Acknowledgements

This project was supported financially by Alberta Crop Industry Development Fund Ltd., Alberta Agriculture and Rural Development, Agriculture and Agri-Food Canada, and the Potato Growers of Alberta and through cash and in-kind contributions from potato industry partners:

ASPI (2011, 2012)
Agristar Inc. (2011)
ConAgra Foods, Lamb Weston Division (2011, 2012, 2013)
Edmonton Potato Growers (2011, 2012, 2013)
Little Potato Company (2012, 2013)
Maple Leaf Potatoes (2011, 2012)
McCain Produce Canada (2011, 2012)
Old Dutch Foods (2011, 2012, 2013)
Parkland Seed Potatoes (2011, 2012, 2013)
PVMI (Potato Variety Management Institute) (2011, 2012)
Rockyview Seed Ltd. (2011, 2012, 2013)
Solanum International Inc. (2011, 2012, 2013)
Tuberosum Technologies Inc. (2011, 2012, 2013)

Special thanks to Simone Dalpe and Tina Lewis for technical support of the trial in 2011. Thank you to seasonal staff Jan Lepp and Mary Lou Benci as well for maintaining, harvesting and grading the trial. Thank you to Len Hingley and William Lai for extra help at harvest. Thank you to Jan Lepp for assistance with data entry. Thanks to the staff of the Food Processing Development Centre – Brooks for processing evaluations. Thank you to Dr. Ted Harms for assistance with statistical analyses of the data.

Special thanks to Roland Williams for technical support of the trial in 2012. Thank you to seasonal staff Alanna Penner, William Lai, and Louisa Gietz as well for planting, maintaining, and harvesting the trial. Thank you to Cody Brown, Jennessa McConnell and Mary Lou Benci for extra help at harvest and through grading. Thank you to Tabitha MacKinnon for assistance with data entry.

Special thanks to Roland Williams for technical support of the trial in 2013. Thank you to seasonal staff Bev Lesperance and William Lai as well for planting, maintaining, and harvesting the trial and for data entry. Thank you to Scott Butkiewicz and Don Elmer for extra help at harvest and through grading.