New Potato Cultivar Evaluation for McCain Foods (Aust) Pty Ltd

Scott Clelland
McCain Foods (Aust) Pty Ltd

Project Number: PT09043

PT09043

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Scott Clelland

Research Provider:

McCain Foods (Aust) Pty Ltd &

Safries Pty Ltd

August 2010

Final Report HAL Project

Project No: PT09043 continuation of PT08018

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Purpose of Report: This report provides the final report on this project in which new French Fry potato cultivars have been evaluated in 4 regional trials and one seed multiplication plot during 2009-2010.

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4. David Ryan, who did all of the setting up and planning for this project, and who has been project leader of this project for many years providing the basis for this report.

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Media Summary

The evaluation and identification of new French Fry cultivars with improved processing and agronomic characteristics adapted to different production regions of Australia is essential for the Potato Industry to remain competitive, profitable and sustainable.

French Fry new Varieties need to have yield and French Fry processing parameters equal to or greater than existing processing varieties. Cultivar selection requires the variety to have improved specific French Fry quality parameters and show stable high yields. Varieties need to be more efficient or require reduced inputs such as chemical and fertilisers to have minimum impact on the environment and reduce the costs of production.

McCain Foods (Aust) Pty Ltd and Safries Pty Ltd in partnership with the McCain growers groups in Victoria, New South Wales and Tasmania and the Safries grower group in South Australia along with matching funds from HAL have tested potential new potato lines for the French Fry industry over the past twelve months. Trials were conducted in Ballarat (Victoria), Berrigan (Riverina, NSW), Forthside (Tasmania) and Penola (South Australia).

This project has evaluated and identified potential new varieties for the French Fry Industry, as well as allowing uptake into the wider potato industry. Under previous evaluation projects some varieties were selected as potential replacements and these continue to be evaluated.

Further evaluation of breeding lines across production environments is needed to determine their potential for commercialisation. It is planned that this project is continued next season to carry out further evaluation of some highly potential varieties. Assessments of advanced cultivars are showing very good results and the likely chance of a replacement cultivar is high, with one Australian breed cultivar in early stages of commercialisation.

Technical Summary

Potato genotypes introduced from the Potato Breeding program at Toolangi were evaluated in field experiments in 4 major potato growing regions of South Eastern Australia. In the 4 trial sites new cultivars were grown in randomised block experiments, with 3 replicates per entry, 3 trials were located within commercial crops and compared against current French Fry commercial cultivars and the Tasmanian trial was located on the Forthside research facility. All cultivars that are included in the program are maintained at the Toolangi research farm as seed for future variety work. Also as part of the project there was a seed multiplication observational plot at Forthside.

The project identified new varieties with potential French Fry processing capabilities. Promising newly bred lines were identified at each trial site and further evaluation will be required before possible commercial release. Cultivars will be tested over a number of seasons to determine if they are consistent in results. The cultivars that will be evaluated further include: Cultivar 53, Cultivar 22, Cultivar 62, Cultivar 67, Cultivar 68, Cultivar 95, Cultivar 111, Cultivar 140 and Cultivar 145, Cultivar 93 and Cultivar 158.

The promising new varieties in this project are not yet in commercial production so it is not possible to accurately estimate the improved financial gain, estimate market share, costs of growing new lines, reduced chemical inputs and financial gains at present. However, the high potential yields and reduced input costs of new varieties will result in future substantial financial gains.

McCain Australia has progressed one cultivar, Cultivar 53, into the commercialisation program entering year 2 of large scale commercial trials in 2010. The company will process a reasonable volume of trial material in 2010 enabling accurate data to assist with the future direction of Cultivar 53. During season 2008-2009 and 2009-10 the commercial trials of Cultivar 53 have shown mixed results with some major concerns about the storability of the cultivar due to damage to the tubers over commercial harvesters.

Introduction

New Potato varieties with improved French Fry characteristics are required to help maintain and increase the competitive position of French Fry potato growers and to improve the processing recovery rates of French Fry processing plants. Such improved varieties must meet the demands of the processing potato grower and the processor at the same time, with high yield, reduced cost of growing and excellent processing attributes.

This project is aligned with McCain Foods support of the Australian potato breeding program and the results from this development program are important in seeing as potatoes exhibit a significant genotype by environment effect and developing adapted cultivars to these various environments is critical for the long-term sustainability of the industry.

McCain Foods processes its potato crop at one of its 3 factories positioned in Ballarat, Victoria, Penola, South Australia or in Smithton, Tasmania. McCain Foods process approximately 25% of the potatoes in Australia. The entire supply chain will benefit from successful French fry cultivars including seed growers, processing growers, transport companies, commercial outlets and consumers, while unsuccessful French fry cultivars can be selected for the wider potato industry such as fresh and crisp through Tony Slater assessing lines.

Recently, an increasing volume of imported frozen potato products have begun to threaten the national potato processing industry. Having an Australian breeding program focused on enhancing the competitive nature of growers and the company is seen as integral part of our strategic plan to enhance this economic contribution to the economy and the public good by maximising the competitive position of the company and growers.

Any new variety which is bred within this program is available for use by any breeding program here in Australia. This is seen as a key benefit to the Australian potato industry as some of the target traits are quite Australian specific in their nature.

Common problems with current French Fry processing varieties include: susceptibility to physiological disorders such as misshapen tubers, second growth and hollow heart (mainly Cultivar 5), susceptibility to diseases such as Target Spot, Common Scab, Powdery Scab, Pink Rot, Rhizoctonia and Late Blight and susceptibility to Virus's such as Potato Leaf Roll and Tomato Spotted Wilt Virus (mainly Cultivar 6). Other problems include geographical constraints with environmental conditions limiting varietal options available to growers and processors.

In partnership with grower groups from each major potato growing area, McCain Foods (Aust) Pty Ltd has undertaken this variety development program with high importance. As a research priority McCain Foods has given variety breeding, selection and development its highest level of commitment and we believe that the potential for a positive result is very likely.

Methods

Experimental design

Crossbred lines and new or check varieties used in this project have been either bred in Australia or introduced under private arrangements by McCain Foods (Aust) Pty Ltd or commercial partners. The Department of Primary Industries, Toolangi, Victoria carried out the breeding. Each of these new lines were grown from botanical seed in a glasshouse and after 3 field generations, during which time selection begins and seed is multiplied, clones are then selected to be entered into district variety trails. All trials were planted with seed produced, harvested and stored under the same conditions to obtain seed of the same physiological age for valid comparisons.

Field experiments were conducted using a randomised block design replicated in each of the 4 blocks. Three of the 4 experiments were grown within commercial crops, with the Tasmanian replicated trial and seed multiplication plot being grown at the Forthside research facility. Within each experiment the common commercial variety for the particular time of delivery and district was used as standard controls. Individual plots were either 4 or 5 metres long (depending upon trial site) with 2 rows per plot. Coloured maker plants (Ruby Lou or Toolangi Delight) were planted at the beginning and end of each plot in a one-metre strip to prevent mixing of varieties at planting and harvest. During the growing season, plots were assessed for emergence, vigour, maturity and pest and disease susceptibility. At harvest plots were assessed for tuber characteristics including colour, texture, shape, distortion, eye characteristics, size and evenness. Each plot was yield graded by size's specific to processing parameters for French Fry processing, but also allow for evaluation from the wider potato industry. The grading of the tuber size in the Berrigan trial was done as has occurred in the past by tuber weight, but in the other trials sites tuber length was used to grade them into different parameters – 0-75mm, 75-90mm, and 90mm+.
Also used in the results was the DPI's Breeders Visual Preference (BVP) scale to assess the varieties. A scale from 1-9 (9-perfect) assessing tuber size, shape, uniformity vs. deformities (skittles, secondary growth, cracking, internals).

Samples from each plot were removed after grading, with one sample from each plot assessed at McCain Foods (Aust) Pty Ltd testing facilities for Dry Matter content and cooking ability. Also removed from each plot (Tasmanian seed multiplication plot not included) was a storage sample which is held in commercial storage facilities by McCain and at 3 staggered intervals during the next 7 months one replicate of samples will be removed and tested for processing attributes again.

Field experiments were conducted at Dunnstown near Ballarat – Victoria (24 entries), Mingbool near Penola – S.A. (16 entries), Berrigan – NSW (16 entries), and Forthside Research Farm – Tasmania (11 entries). The New South Wales trial was planted late September and harvested in early February. The South Australian trial was planted in early November and harvested in mid April, Victorian planted early-November and harvested in mid-May, and the Tasmanian trial was planted in mid-November and lifted in mid April. Ballarat and Forthside soil types are similar Krasnozem.

Data was analysed by standard analyses of variance procedures. Least significant differences (LSD) among treatment means were expressed at the probability of 5%. This means that the calculated LSD between treatment means is 95% due to the treatment per se (in this case the genotype) and only 5% due to chance or random effects such as irrigation or soil variations between plots (Williams 2004).

Results and Discussion

Complete results from harvest and processing assessments for the four experiments are included in Appendix 1 along with written assessment of the Tasmanian seed multiplication plot.

In the individual variety results part of this section, the varieties have been separated into longer / oblong shaped tubers more suited to French Fry production, and at the end of 'Results and Discussion' is the varieties with round tuber type suited to wedge production.

Summary Graphs of Individual Trial Site Results

Below are graphs summarizing each individual sites yield results, with the columns divided into tuber size categories, and dots representing the percentage dry matter. The Berrigan trial results are divided into tuber weight categories (0-70g, 70-170g, 170-240g, and >340g), whereas the other trials were assessed on tuber length (0-75mm, 75-90mm, and >90mm).

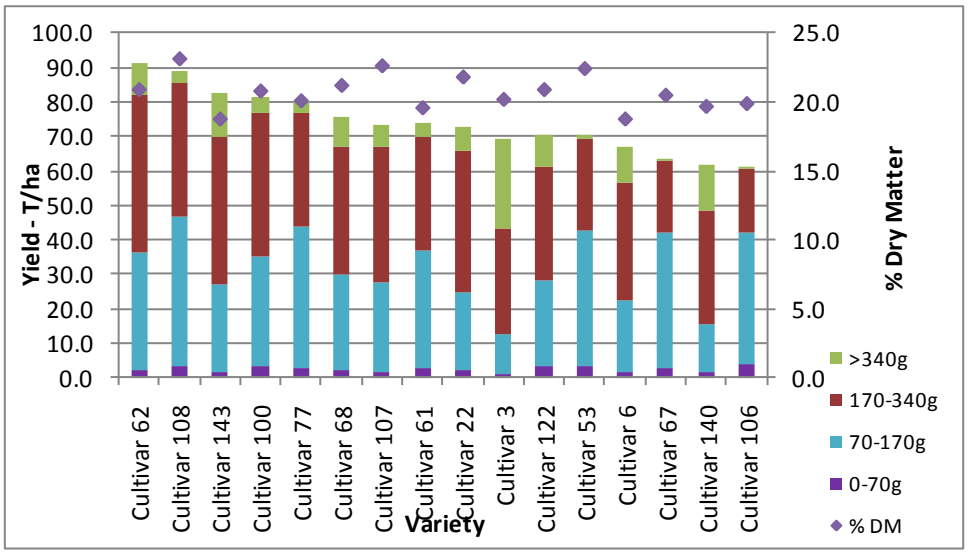

Figure 1: 2009-10 Berrigan Dry Matter and Yield by distribution of tuber weight

Note: Yield parameter measurements for Berrigan have tubers segregated by weight in grams (tuber weight), other location results are measured in millimetres (tuber length).

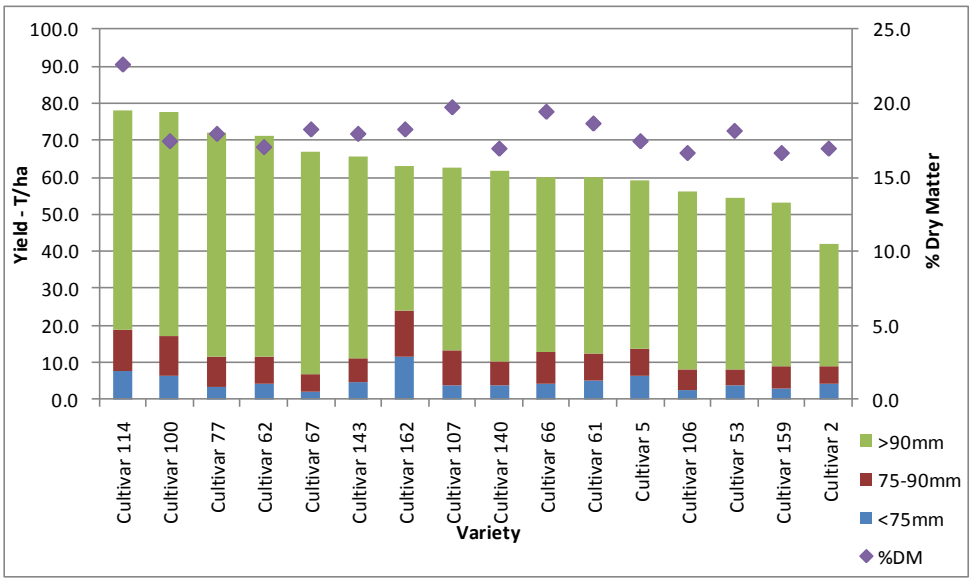

Figure 2: 2009-10 Penola Dry Matter and Yield by distribution of tuber length

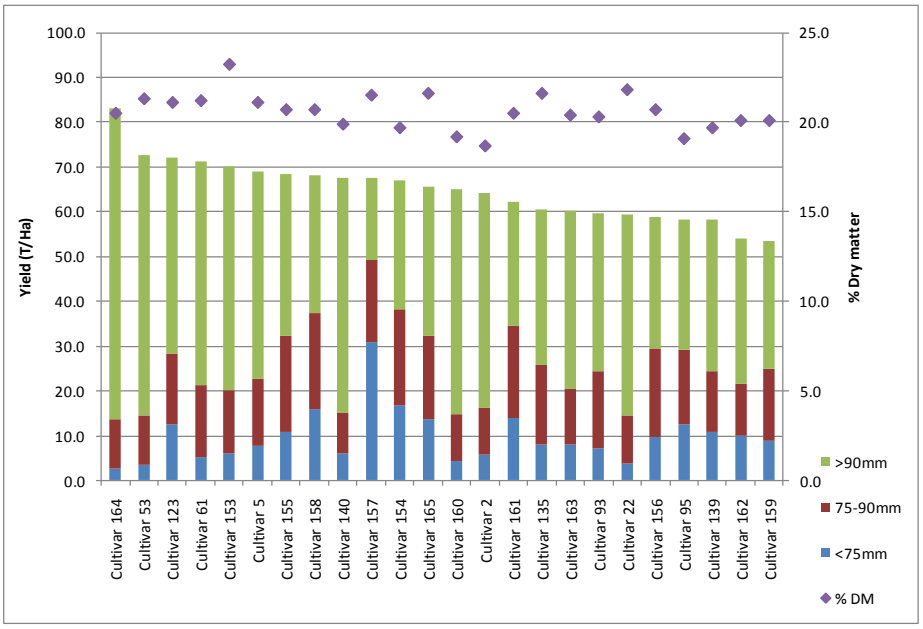

Figure 3: 2009-10 Ballarat Dry Matter and Yield by distribution of tuber length

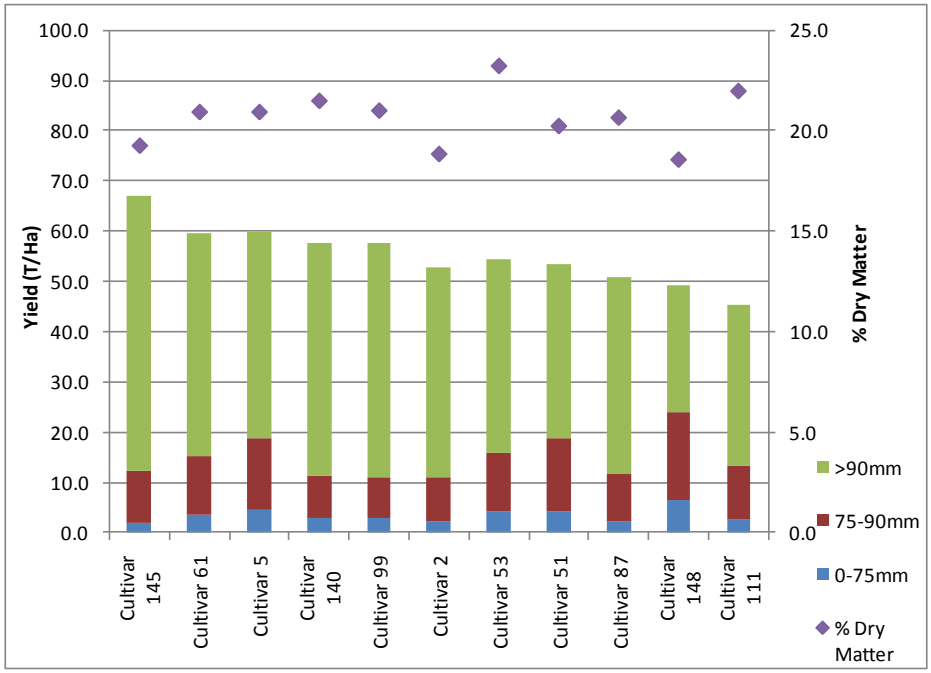

Figure 4: 2009-10 Tasmania Stage 2 Dry Matter and Yield by distribution of tuber length

French Fry Type Lines

Cultivar 5

Cultivar 5 is the main French Fry processing variety that is grown in Australia, therefore it was used as a check variety in the Victorian, South Australian and Tasmanian trials and the Tasmanian seed multiplication plots. Cultivar 5 is a long maturing variety that requires significant inputs during the season. It requires certain environmental conditions to be in its

favour to reduce the pest and disease incidence. Cultivar 5 has the ability to be stored for an extended period of time and still retain its processing attributes.

Cultivar 3 and Cultivar 6

Cultivar 6 and Cultivar 3 are the main early to mid varieties used for French Fry production in Australia. They have a medium length maturity, which enables Cultivar 6 to be used for December, January, and February processing, and Ranger January and February. Cultivar 6 and Cultivar 3 are not stored by McCain Foods (Aust). Both varieties set only average tubers per plant and can produce larger size tubers, which are undesirable for processing.

Cultivar 2

Cultivar 2 has been developed into a major variety for Australia. It is used in the trials as a check variety. Cultivar 2 has a yellow flesh colour and an early to mid maturity length, enabling it to be processed and stored earlier than Cultivar 5. Tuber shape is very good with dry matter on the lower end but that is common with this cultivar. Seed vigour in the Penola variety trial was very poor and is likely to have caused the poor yield. The seed source for the trials will be reviewed.

Cultivar 61

Cultivar 61 has been imported into Australia by a private firm. McCain has the first right of refusal on this cultivar. It has performed well in earlier seasons but has been disappointing during the past 2 seasons.

Variable shape and lateral bumps is a concern that was noted at Berrigan, Penola, and Tasmania (Breeders Visual Preference (BVP) score averaged 5.0). Although at Ballarat the shape was better (6.0), but large tuber size and relatively low set indicates plant spacing should be closer next season. Common scab was also noted at Berrigan and Penola, but not in Tasmania. Cultivar 61 has yielded relatively well, in the top 3 for Ballarat and Tasmania, and around the middle yielding for Penola and Berrigan. Minituber production has been undertaken therefore Penola will commercially trial this variety.

Cultivar 22

Minitubers of Cultivar 22 have been produced. This variety performed especially well at Berrigan because of the good shape (some slightly oblong), a BVP of 7.7, and yielded with a fry ranking of 9th. However at Ballarat with a shape of only 5.5 BVP it did not stand out.
Continue at Berrigan and minitubers will also be planted in Ballarat for multiplication of the variety.

Cultivar 51

Cultivar 51 was trialled again in Tasmania – over the last few years it has ranked between 4-8 by fry grade yield. Generally it had good tuber shape, although some had a slight taper. Some variation between replicates, with 1 rep showing low numbers and some tuber size variation. One of the selections at the Tasmanian harvest. BVP of 6. Retrial in Tasmania.

Cultivar 53

Cultivar 53 has been commercialized and processed through factories without great success at Ballarat and Tasmania due to problems of harvesting over commercial harvesters causing damage going into storage. It yielded well in the Ballarat trial, but the small plot trial did not stand out in Penola for yield however commercial plots in the district yielded quite well. Because of Cultivar 53's powdery scab susceptibility, its growing location is important to avoid this. Potatoes from storage in Penola are about to be processed, so the results will influence Cultivar 53's future. Rot was noted in Penola's trial with low tuber numbers, and the colour results are a concern with thirty three 1's. The BVP over all sights averaged 6.8. In the past season trials Cultivar 53 has performed well especially in Ballarat trial with its overall appearance one of the better looking cultivars. The Tasmanian trials of Cultivar 53 have resulted in the highest yielding cultivar with the odd paired shape tuber, but the problems noted above have resulted in it being discarding from their production. In the Penola trial it has had excellent tuber appearance with high yields. Maturity of the cultivar is later than Russets, which is a major negative. McCain Australia has exclusive rights to this cultivar and has entered into an agreement on worldwide exclusivity.

Cultivar 62

Cultivar 62 had a great yield (best at Berrigan) but the shape of Cultivar 62 is too round for French fries and an uneven shape (BVP at Berrigan of 5.3). In past seasons this variety has yielded well at Penola and has appeared to perform well under heat, but the severe common scab noted at Penola resulted in the decision to discontinue this variety.

Cultivar 66

Cultivar 66 had a severe growth cracking, with low tuber numbers, and uneven size distribution with rot in replicate 1 at Penola this season. It ranked 6th in yield in the 08/09 trial but 11th in this season's trial. It was been included in Penola over the last couple of seasons due to length issues on heavier soils at other sites, but has also shown slight susceptibility to heat stress. We do have this in maintenance tissue culture, but it has not performed so we will discontinue.

Cultivar 67

Cultivar 67 is a slightly yellow flesh variety, it performed okay in Berrigan with a good shape (tuber score of 6), although the concern is the size was slightly small due to high tuber set. This is indicated by virtually no tubers over 340g, also resulting in a poorly ranked yield at Berrigan. The tuber set at Penola was low, resulting in large tuber size, and also some fry colour, rots and growth cracks. The fry grade rank of 5 at Penola this season, and 4 last

seasons reiterates what has been seen in the past that it can have a high yield. Last season some powdery scab was noted at Penola for the first time, but none noted this season. Penola would like to see this variety commercially trialled, therefore it will be placed into tissue culture. Retrial again in Berrigan.

Cultivar 68

Some bumps on tubers throughout all replicates. Some common scab and growth cracks. This variety has yielded well in the past, particularly at Penola. This season severe common scab was noted at the Berrigan trial site. McCain have this variety in maintenance tissue culture and some minitubers and early generation material that will be tested over the coming 2-3 seasons.

Cultivar 77

Good yield in both Berrigan and again at Penola trials, although shape was slightly pear shaped/uneven at Berrigan - BVP of 5.8. Good numbers, especially at Berrigan. The low solids were noted last season in this variety at Penola, and have occurred again. Scab was noted again this season after being noted last season. Continue with Cultivar 77 one last time to make a decision on whether to place this variety into tissue culture.

Cultivar 87

Secondary growth and lateral bumps. Cultivar 87 had a very poor yield result in 2008-09, and was only just included this year, but it has not performed therefore discontinue.

Cultivar 93

Cultivar 93 has a light yellow flesh and nice oblong shape (BVP 7). It is medium maturity, with some rots. Slightly small tuber size and low yield. It has not performed in Penola in the past due to shape, but the shape at Ballarat continues to be good, it was a pick by the Ballarat Ag team. Retest at wider spacing of 35.7cm at Ballarat only to attempt to get size into the sample.

Cultivar 95

Mid/late maturity, oblong-long shape, small & uneven size, light yellow flesh, low yield, and some brown centre (slight growth crack & slight shatter crack in 2007/8). Did not perform at other trial locations in 2008-09, and was only slightly better at Ballarat in 08-09 and retrialed but has not stood out. It has also has been prone to cracking with minimal impact. Discontinue.

Cultivar 99

Some misshapes with the odd pear, and bump, and quite flat. BVP of 6. It has been found over the past seasons to have a good tuber shape as was shown this season. It had an even

size range, with a fry ranking of 5. Clean, with heavy russeted skin. Cultivar 99 was picked as one of the better cultivars in the Tasmanian trial, so continue.

Cultivar 100

Cultivar 100 has shown to yield very well in Penola, and this was shown again as the top yielding line at Penola, but dry matter was very low. Berrigan results showed higher dry matter and still good yield. Tubers had the odd bump, and BVP of 6.5. Continue at Berrigan, and Penola with particular focus on dry matter and its associated fry quality issues.

Cultivar 106

Again Cultivar 106 has not shown a good yield as has been seen in past years at either site. It is known for its small tubers, but good length tubers occurred this year at Berrigan (BVP 5.5). Very low solids occurred at Penola again and was slightly bumpy. With no improvements from previous years we will discontinue Cultivar 106.

Cultivar 107

Slightly bumpy shape with brows and eyes was noted again this season as has been seen in the past, but again good numbers have resulted. A BVP at Berrigan of 5.7. Cultivar 107 was one of the better varieties at both sites so we will keep it in to retrial at both sites for the last time.

Cultivar 111

Lateral eyes throughout all replicates, BVP of 5.8. Good russeted skin. Lowest yielding line at Tasmania stage 2. Cultivar 111 was discarded from mainland trials due to low yield. Also have seen distortion when large in past seasons, but this was picked as one of the better lines with good shape and clean, from the Tasmanian trial so will be trialled again next year.

Cultivar 114

Good yield with the number 2 ranking at Penola. Common scab was noted which has not been seen in the past. It has been discarded from the Ballarat and Tasmanian trials in 2008-09 due to poor tuber shape, but at Penola it only showed a slightly flat shape. This variety was spaced out at Penola this year, which appears to have succeeded except for the 3rd replicate tubers were small due to high tuber number. Consistently high solids, which will be examined in more detail when it is retrialed in Penola.

Cultivar 122

Performed well at the Penola site in 2008/09 with a fry ranking of 3, although this was lower this year on 11th. Shape and size can be slightly variable (BVP 6.5) and odd heel and eye. Last year it showed 10% ends in the cooking test but this year the cook was clean. Retrial in Berrigan and place in tissue culture for commercial trials at Penola.

Cultivar 123

Cultivar 123 had a round shape when small (which was seen last year), but gets nice long even shape when larger (BVP 6.0). It had a high yield with a fry ranking of 5ththis year, compared with 12th last year. Plants did not close rows (very severe Sencor damage 2008/9). Picked as a better variety in Ballarat trial therefore Retrial.

Cultivar 135

Very late maturity (RB plus 1 wk), and plants did not close rows. High tuber number per plant resulted in a lot of smalls in some replicates. Low yield. Oblong shape with some round/flat and pear shaped tubers. BVP of 5.7. High number of rots, high dry matter. (many hollow tubers in 2007/8). Discontinue.

Cultivar 139

Oblong/round slightly flat shaped tubers. Too round for fries and too large for wedges. Slightly deep eyes 4.7 BVP. Many rots. Low tuber number per plant, low yield. Discontinue

Cultivar 140

Cultivar 140 is a late maturity variety (5-7 days longer than Cultivar 5) with long tuber shape. Its flesh is light yellow/cream. It had a high yield at Ballarat and Tasmania, following the same rank of 7 last year at Ballarat. There was a lower yield at Berrigan and Penola, but good shape. Lower tuber set per plant led to a large tuber size. Some tubers did get slightly misshapen. Tasmanian results did show a high number of ends with colour, but clean internally.

This variety was placed into tissue culture and minituber production last year, therefore continue with this variety especially in Tasmania and Ballarat, and Penola along with minitubers testing over the coming seasons.

Cultivar 143

Good yield at both Penola and Berrigan sites. The tuber shape was slightly bumpy and had the odd taper, but generally okay with a BVP of 7.2 at Berrigan. Dry matter was a concern, and common scab noted at both sites. This was trialled at Penola and Berrigan for the first time to try and get some length as it was too round in Ballarat trial 2008-09. Continue at Berrigan, and Penola.

Cultivar 145

Top yielding line from Tasmania. Good size and shape (some a bit pinched) – BVP 7.2, and even. The odd green tuber the only thing noted during harvest except for the odd taper or flat. This variety was discarded from Ballarat trial last year due to fry colour and low tubers per plant, but appears to be performing well in Tasmania. 3.3% ends noted during cookup.
Continue in Tasmania.

Cultivar 164

Cultivar 164 had the highest yield for the Ballarat trial by far. It was very late maturing (Cultivar 5 plus 1week), and the plants did not close the canopy between the rows. It has a slight cream flesh tuber. The tuber size was very large, with low number of tubers per plant, and an oblong shape but slightly knobbly. There was some slight powdery scab. It did not impress but with the very high yield we will retrial, but reduce the plant spacing to reduce the tuber size.

Round / Wedge Type Lines

Cultivar 108

Deep eyes with the odd bump. 6.5 BVP. Good yield – number 2 ranking this year but number 24 ranking last year in Ballarat, and 4th in 2007-08. Very good dry matter. We will test this variety at Ballarat next year, and include Atlantic – the standard round variety used for wedge production, and also continue with it in Berrigan.

Cultivar 157

Cultivar 157 produced a medium yield, with high dry matter, but some deep eyes & heels. The round size distribution was pretty good and even (BVP 5.5) Some tubers did get some length. Hollow heart observed in larger tubers, also one 2 in 75 strips. Discontinue.

Cultivar 158

Cultivar 158 was a very late maturing variety (1 week later than Cultivar 5) with a round even shape (slightly flat). It had a medium size but there was some size variation. Some fleck was noted which must be monitored. One 1 in 75 strips. 5.8 BVP. Retest.

Technology Transfer

A field day was conducted during the Victorian harvest with members of the McCain Foods processing plant and management in Ballarat. Local growers were also welcome to inspect the trial site during the season.

Along with the local McCain field staff, Tony Slater, Victorian Primary Industries, was invited to attend all of the trial harvests to observe breeding crosses outcomes in different environments and help with the improvement in selection process for breeding to the potato breeding program. This evaluation across these environments will help develop cultivars with adapted backgrounds for the majority of Australia's production areas for use in all market sectors. It also allows for unsuccessful French Fry cultivars to be selected for the wider potato industry such as fresh and crisps.

Confidential results from all trial sites will be presented to each grower group and also to the McCain Foods Variety evaluation committee. A public version of the results is available by contacting HAL.

Recommendations

Specific recommendations are stated in the description of each variety, but several varieties including Cultivar 67 and Cultivar 122 will be placed into tissue culture to allow assessment in commercial situations over the next couple of seasons. There are also 4 other varieties from previous HAL projects (especially PT08018) with minitubers available in 2010 that will be evaluated in commercial fields from the 2010-11 season.

Further evaluation and development of new French Fry varieties is required prior to the commercialisation of any cultivar. The past seven seasons have shown that with the industry groups taking a far greater ownership in variety evaluation and commercialisation of new cultivars, interest in the variety trials conducted under this project has been very high. Industry groups are anticipating return on their investment into research and development and a superior variety to current varieties will achieve this. Over the past few seasons we have included six varieties into tissue culture that have shown potential. The cultivars that we continue with will be bulked up over the next few seasons during which we need to further develop agronomy programs for each specific cultivar. Currently this work is funded privately.

In further advanced commercialisation trials Cultivar 53 was trialled last season in all processing plants. Results have shown concern over the storability of the variety. High levels of tuber damage and levels of tuber rots combined with some poor fry colour from later harvested material and also from out of storage have been observed. Due to these observations the variety will be discontinued from further trialling except for Penola where it will be placed in scab free areas.

This project is planned to continue next season (VC Project funding pending) in a similar capacity as season 2009-2010. Small plot trials give industry personnel a scientific result, with definitive answers arrived upon, making the selection process a constant variable from year to year. The size of the project over four states (water permitting) is also allowing for

variability in cultivar performance due to environmental conditions to be evaluated, this is very important when the French Fry processor is sourcing its raw product from many different districts with different climatic constraints.

Appendix 1.

Ballarat, Victoria Potato variety evaluation trial 2009-10

Ballarat (Dunnstown) is the main delivery and storage district for McCain Foods Ballarat processing plant. Planted in early November, the trial was lifted on the 18th May 2010.

Table 1.

Ballarat trial comparison of potato lines for different tuber yield length grades, tubers per plant and processing parameters.

		yield [tonnes/hectare]													
	spac	tuber length		tuber weight			rank	tubers	%	fry score					
entry	in	<75mm	>90mm	gross	<100g	>100g	>100g	/plant	dm	0	1	2	3	4	end
Cultivar 61	33.0	5.2	49.8	71.1	2.2	68.9	3	8.1	21.2	100					
Cultivar 2	27.9	5.9	47.9	64.2	3.0	61.0	11	7.0	18.7	100					
Cultivar 5	38.1	7.7	46.5	69.1	4.4	64.7	6	11.6	21.1	100					1.2
Cultivar 22	38.1	3.9	44.9	59.3	2.5	56.8	15	8.1	21.8	100					
Cultivar 53	33.0	3.4	58.1	72.6	2.0	70.6	2	8.0	21.3	96	4				
Cultivar 93	33.0	7.1	35.1	59.6	5.4	54.2	18	9.8	20.3	100					
Cultivar 95	33.0	12.5	29.0	58.3	6.0	52.3	20	10.4	19.1	100					
Cultivar 123	35.6	12.6	43.8	72.1	6.9	65.2	5	12.2	21.1	100					
Cultivar 135	38.1	8.1	34.9	60.6	4.2	56.4	=17	12.0	21.6	100					
Cultivar 139	30.5	10.9	33.9	58.3	4.5	53.8	19	7.6	19.7	100					
Cultivar 140	30.5	6.0	52.5	67.7	3.4	64.3	7	7.0	19.9	100					
Cultivar 153	30.5	6.2	49.8	70.1	3.9	66.2	4	8.8	23.2	100					
Cultivar 154	30.5	16.9	28.7	66.9	8.2	58.7	12	11.8	19.7	97.2	2.4				
Cultivar 155	30.5	10.8	36.1	68.3	4.4	63.9	8	8.7	20.7	100					
Cultivar 156	33.0	9.7	29.3	58.9	6.8	52.1	21	11.0	20.7	98.4	1.2				
Cultivar 157	30.5	30.9	18.6	67.7	9.6	58.1	14	13.3	21.5	98.4		1.2			
Cultivar 158	30.5	15.8	30.5	68.0	5.6	62.4	9	9.9	20.7	96	4				
Cultivar 159	30.5	8.8	28.7	53.6	7.0	46.6	23	9.0	20.1	100					
Cultivar 160	30.5	4.3	50.1	65.0	3.1	61.9	10	7.1	19.2	100					
Cultivar 161	33.0	14.1	27.7	62.3	5.9	56.4	=17	10.8	20.5	100					
Cultivar 162	30.5	9.9	32.5	54.1	4.5	49.6	22	7.1	20.1	100					
Cultivar 163	30.5	8.0	39.8	60.3	3.6	56.7	16	7.8	20.4	98.4	1.2				
Cultivar 164	30.5	2.8	69.4	83.0	1.7	81.3	1	6.8	20.5	98.4	1.2				
Cultivar 165	30.5	13.6	33.4	65.6	7.4	58.2	13	10.7	21.6	100					
LSD [p=0.05]		1.6	7.8	11.3	1.4	11.4			0.6	0.8					
LSD [p=0.01]		2.3	10.6	15.3	1.9	15.4			0.9	1.1					

South Australian (Penola) Potato Variety evaluation trial 2009-2010

Penola district (South East S.A.) is the main delivery and storage district for Safries processing plant in Penola, as well as a source of February and March deliveries to McCain Foods Ballarat processing plant. Planted in early November, the trial was lifted in mid April 2010.

Table 2
Mingbool trial comparison of potato lines for different tuber yield length grades, tubers per plant and processing parameters.

		yield [tonnes/hectare]													
	Spacing	Tuber Length		Tuber Weight			Rank	Tubers	%	Fry Score					
Variety	cm	<75mm	>90mm	Gross	<100g	>100g	>100g	/plant	dm	0	1	2	3	4	tips
Cultivar 61	30.5	5.1	47.3	59.8	2.6	57.2	10	6.8	18.6	100					
Cultivar 2	25.4	4.3	33.0	42.0	2.6	39.4	16	4.4	16.9	100					
Cultivar 5	35.6	6.2	45.7	59.2	3.9	55.3	12	8.4	17.4	100					
Cultivar 53	33.0	3.7	46.3	54.5	3.9	50.6	15	7.3	18.1	67	33				
Cultivar 62	30.5	4.4	59.5	71.1	3.6	67.5	4	8.4	17.0	100					
Cultivar 66	33.0	4.4	47.6	60.2	4.2	56.0	11	7.9	19.4	100					
Cultivar 67	35.6	2.0	59.7	66.7	2.5	64.2	5	8.0	18.2	67	33				
Cultivar 77	30.5	3.4	60.6	71.9	3.3	68.6	3	9.1	17.9	100					
Cultivar 100	30.5	6.4	60.5	77.4	2.9	74.5	1	8.5	17.4	100					
Cultivar 106	35.6	2.5	48.1	56.3	2.9	53.4	13	7.6	16.6	100					1
Cultivar 107	33.0	3.7	49.2	62.5	3.9	58.6	9	10.1	19.7	100					
Cultivar 114	33.0	7.7	59.0	77.9	7.4	70.5	2	12.3	22.6	100					
Cultivar 140	30.5	3.7	51.7	61.8	2.4	59.4	8	6.7	16.9	100					
Cultivar 143	30.5	4.7	54.6	65.6	3.9	61.7	6	8.6	17.9	100					2
Cultivar 159	30.5	2.9	44.2	53.0	2.2	50.8	14	6.4	16.6	100					
Cultivar 162	30.5	11.4	38.8	62.9	2.5	60.4	7	7.8	18.2	100					1
LSD [p=0.05]		2.6	12.3		1.4	12.7			1.3						
LSD [p=0.01]		3.5	16.6		1.8	17.1			1.6						

Berrigan, NSW Variety Evaluation trial 2009-10

Riverina (Berrigan) is an early delivery district for McCain Foods Ballarat processing plant and the Safries processing plant in Penola. Planted in late September, the trial was lifted on the 8th of February 2010.

Table 3.
Riverina trial comparison of potato lines for different tuber yield weight grades, tubers per plant and processing parameters.

	spacing	yield [tonnes/hectare]					rank	tubers	%	fry score [25 strips]				
entry	cm	0-70g	70-170	170-340	>340g	>70g	>70g	/plant	dm	0	1	2	3	4
Cultivar 61	31.2	2.7	34.0	33.3	4.0	71.3	8	11.9	19.6	100				
Cultivar 3	35.7	1.0	11.3	30.7	26.1	68.1	10	8.8	20.2	97	3			
Cultivar 6	31.2	1.3	21.3	33.9	10.2	65.4	13	9.8	18.8	99	1			
Cultivar 108	25.7	3.1	43.4	38.8	3.6	85.8	2	12.3	23.1	100				
Cultivar 22	35.7	2.0	22.4	41.4	7.0	70.8	9	12.5	21.8	100				
Cultivar 53	33.4	3.3	39.5	26.7	0.8	67.0	12	14.6	22.4	100				
Cultivar 62	31.2	2.0	34.1	45.7	9.4	89.2	1	12.8	20.9	100				
Cultivar 67	35.7	2.4	39.9	20.8	0.6	61.3	14	14.8	20.5	100				
Cultivar 68	31.2	2.0	27.7	37.1	8.7	73.5	6	11.5	21.2	100				
Cultivar 77	31.2	2.7	41.3	33.0	3.1	77.4	5	14.1	20.1	100				
Cultivar 100	31.2	3.0	31.9	42.0	4.8	78.7	4	13.3	20.8	100				
Cultivar 106	33.4	3.7	38.6	18.4	0.7	57.7	16	14.4	19.9	97	3			
Cultivar 107	33.4	1.2	26.2	39.4	6.7	72.3	7	11.5	22.6	100				
Cultivar 122	31.2	3.4	24.7	32.8	9.6	67.1	11	11.6	20.9	100				
Cultivar 140	31.2	1.6	13.8	33.3	12.9	60.0	15	8.0	19.7	100				
Cultivar 143	31.2	1.6	25.2	43.0	12.9	81.1	3	11.5	18.8	100				
LSD [p=0.05]		1.5	7.8	10.2	4.2	9.3			0.8					
LSD [p=0.01]		1.9	10.0	13.2	5.4	12.4			1.0					

Tasmanian Seed Multiplication bulk potato trial evaluation 2009-2010.

Devonport district (Forthside) is one of the main delivery and storage district for McCain Foods Smithton processing plant. Planted in mid November, the trial was lifted mid April 2009. No yield comparisons are shown, as it was not a replicated trial site. A replicated trial will be undertaken next season on cultivars that are retained.

Table 4.

Observation notes from Forthside seed multiplication plots.

Cultivar	Comments at harvest	Days to Maturity	Length/Width ratio
Cultivar 154	oval shapes, some flats, good tuber number	134	1.4
Cultivar 155	round (wedge/roast?), flattish	125	1.2
Cultivar 156	too small	125	1.5
Cultivar 157	roast, small	125	1.1
Cultivar 158	wedge/roast, good tuber number	134	0.9
Cultivar 159	some distorts, variable shape & small	116	1.4
Cultivar 160	uniform size, but smallish, shape variation?	125	1.3
Cultivar 161	ovals, poor size uniformity, plant wider?, good tuber number	137	1.3
Cultivar 162	some distorts, shape?, uniformity?, few tubers	125	1.2
Cultivar 163	some distorts, wider, few tubers	125	1.4
Cultivar 164	yield potential?, plant wider, large are slightly lumpy, few tubers?	134	1.4
Cultivar 165	very small!, mini roast, good tuber number	109	1.2
Cultivar 2	some distortion, good tuber number	116	1.7
Cultivar 5	shape variation, small!, some distorts, lot of tubers	134	1.4

Tasmanian Potato Variety evaluation trial 2009-2010.

Devonport district (Forthside) is one of the main delivery and storage districts for McCain Foods Smithton processing plant. Planted in late October, the trial was lifted during April 2010.

Table 5
Forthside trial comparison of potato lines for different tuber yield length grades, tubers per plant and processing parameters.

Cultivar	Spacing	Yield and Numbers					Rank	Tuber		Quality							
	in	Chats	Small	Large	Frygrade	Total	By	No.									
	rows	0-75mm	75-90mm	>90mm	>75mm	Yield	Fry	Per	% Dry	Fry Assessment							
	cm	t/ha	t/ha	t/ha	t/ha	t/ha	Grade	Plant	Matter	% 000	% 00	% 0	% 1	% 2	% 3	% 4	Dark End%
Cultivar 51	30	4.2	14.7	34.6	49.3	53.9	8	8.9	20.2	0.0	100.0	0.0	0	0	0	0	3.3
Cultivar 53	32.5	4.2	11.6	38.5	50.1	57.2	7	12.4	23.2	0.0	83.3	16.7	0	0	0	0	10.0
Cultivar 87	32.5	2.1	9.7	39.0	48.6	52.7	9	8.7	20.7	70.0	20.0	6.7	3.3	0	0	0	0.0
Cultivar 99	30	2.8	8.3	46.4	54.7	58.3	5	8.4	21.0	100.0	0.0	0.0	0	0	0	0	7.9
Cultivar 111	27.5	2.6	10.7	32.2	42.8	46.2	10=	6.7	22.0	26.7	66.7	6.7	0	0	0	0	3.3
Cultivar 145	25	1.8	10.4	54.8	65.2	67.2	1	6.6	19.3	0.0	90.0	10.0	0	0	0	0	3.3
Cultivar 140	27.5	2.7	8.6	46.4	54.9	59.5	4	7.7	21.5	0.0	100.0	0.0	0	0	0	0	13.3
Cultivar 148	25	6.3	17.7	25.2	42.8	49.5	10=	8.8	18.6	0.0	90.0	6.7	3.3	0	0	0	6.7
Cultivar 61	30	3.5	11.7	44.5	56.2	60.9	2	9.7	20.9	0.0	100.0	0.0	0	0	0	0	0.0
Cultivar 2	20	2.2	8.9	41.5	50.4	53.6	6	5.6	18.9	0.0	100.0	0.0	0	0	0	0	0.0
Cultivar 5	30	4.4	14.3	41.2	55.5	62.3	3	10.1	20.9	65.6	34.4	0.0	0	0	0	0	22.9
LSD P=0.05		1.2	4.1	14.0	ns	ns		1.6	0.8	38.1	36.3	ns	ns	na	na	na	ns
LSD P=0.01		1.6	5.6	ns	ns	ns		2.2	1.1	52.0	49.5	ns	ns	na	na	na	ns
CV%		20.6	20.9	20.3	16.6	15.6		10.9	2.2	93.9	29.9	165.7	385.4	na	na	na	150.2

Key : nr = not recorded
ns = not significant
na = not applicable

Cultivar	Days to	Quality			Tuber measurements			Hollow Assessment					
	Maturity							1st 10	1st 10	1st 10	2nd 10	2nd 10	2nd 10
		Bruise Ratings			Mean	Mean	Length/Width		Brown			Brown	
		Stem end	Rose end	Shatter	length (mm)	width (mm)	ratio	Hollow%	Centre%	total%	Hollow%	Centre%	total%
Cultivar 51	123.0	2.0	1.2	0.0	112.3	64.5	1.7	0	0	0	0	0	0
Cultivar 53	150.7	4.5	5.2	2.3	116.9	68.9	1.7	0	0	0	0	0	0
Cultivar 87	123.0	2.9	2.0	1.3	125.8	64.7	1.9	0	0	0	0	0	0
Cultivar 99	148.0	0.8	0.4	0.0	111.3	71.3	1.6	30.0	0	30.0	3.3	0	3.3
Cultivar 111	145.0	3.4	1.8	0.0	112.2	67.5	1.7	0	0	0	0	0	0
Cultivar 145	130.0	2.0	0.2	0.0	112.3	69.2	1.6	0	0	0	0	0	0
Cultivar 140	142.0	6.9	6.6	2.7	114.7	70.5	1.6	0	0	0	0	0	0
Cultivar 148	123.0	0.3	0.6	0.0	109.5	63.8	1.7	0	0	0	0	0	0
Cultivar 61	139.0	0.2	0.0	0.0	106.7	68.7	1.6	0	3.3	3.3	0	0	0
Cultivar 2	125.3	0.6	0.1	0.0	121.0	68.5	1.8	0	0	0	0	0	0
Cultivar 5	145.0	2.6	2.1	0.0	111.2	66.0	1.7	3.3	10.0	13.3	0	13.3	13.3
LSD P=0.05	5.4	1.7	1.0	0.5	10.1	3.2	0.1	10.9	5.7	10.5	ns	3.0	4.3
LSD P=0.01	7.4	2.3	1.4	0.7	ns	4.3	0.2	14.9	ns	14.4	ns	4.0	5.9
CV%	2.4	42.0	33.5	54.1	5.2	2.7	5.2	211.8	276.2	145.7	574.5	143.6	166.5

Key : nr = not recorded
ns = not significant
na = not applicable