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**Potato evaluation  
trials - McCain Foods  
(Aust) Pty Ltd**

David Ryan  
McCain Foods (Aust) Pty Ltd

Project Number: PT03028

## **PT03028**

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*Know-how for Horticulture™*

**Final Report for**

**Horticulture Australia Limited**

Project Number : **PT03028**  
(Completion date 30/8/04)

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

**David Ryan**

Research Provider:  
McCain Foods (Aust) Pty Ltd &  
Safries Pty Ltd

August 2004

## Final Report HAL Project

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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 during 2003-2004.

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3. The numerous potato growers and research facilities who have contributed to the work, in time and resources over the past twelve months.

**Date:** August 2004

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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 French fry Potato Industry to remain competitive, profitable and sustainable.

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 for stable high yields. Variety's need to be efficient or require reduced inputs such as Chemical and Fertilisers to have minimum impact on the environment, and reduce the costs of production increasing grower returns.

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 Berrigan (N.S.W), Ballarat (Victoria), Forthside (Tasmania) and Penola (Sth Australia).

This project, which is in its first year under changed testing agreements between industry and DPI Victoria, has evaluated and identified potential new varieties for the French fry 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.

## **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. New cultivars were grown in randomised block experiments, with 3 replicates per entry, located within commercial crops or on research farms and compared against current French fry commercial cultivars.

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 21, Cultivar 47, Cultivar 53 and Cultivar 56 (Ballarat) Cultivar 52 and Cultivar 57 (Tas) Cultivar 17, Cultivar 20, Cultivar 53 and Cultivar 55, (S.A) Cultivar 21, Cultivar 27, Cultivar 53 and Cultivar 55 (Riverina).

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 yields and reduced input costs of new varieties will result in future substantial financial gains.

## **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.

Existing varieties are not ideally suited to all Australian production areas and systems. 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 disease's 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.

Recent developments within the Australia Potato breeding program has seen the industry taking a far greater ownership of developing new cultivars. 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 it's highest level 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. The breeding was carried out by Potato Geneticist, Dr Roger Kirkham (now retired from this position) at the Department of Primary Industries, Toolangi, Victoria. Each of these new lines was 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 3 blocks. 3 of the 4 experiments were grown within commercial crops with the Tasmanian experiment 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 5 metres long with 2 rows per plot. Coloured marker plants (Desiree) 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 is yield graded by size's specific to processing parameters for French fry processing.

Samples from each plot are 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 (Riverina trial not included) is 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 is removed and tested for processing attributes again.

Field experiments were conducted at Learmonth near Ballarat – Victoria (32 entries), Savernake near Berrigan – N.S.W (24 Entries), Mingbool near Penola – S.A. (12 entries) and Forthside Research Farm – Tasmania (14 entries). The Victorian trial was planted in mid November and harvested in April, the Tasmanian trial was planted in late October and lifted in mid May, the Sth Australian trial was planted in October and harvested in early April whilst the N.S.W trial was planted in September and harvested early February. Ballarat and Forthside soil types are similar Krasnozems and both Mingbool and Savernake are sandy type soils.

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 is included in Appendix 1.

Table M1 below gives a comparison of selected French fry cultivars from the 4 field trials during the 2003-2004 growing season. Fry grade yield is expressed as tonnes per hectare and fry colour as a percentage.

**Table M1.**

Entry	Fry grade yield (t/ha) (fry colour in parentheses)			
	N.S.W $\phi$	Vic $\phi$	S.A+	Tas $^{\wedge}$
Cultivar 5		64.6 (100)	65.0(96)	60.8 (100)
Cultivar 6	40.1 (94.4)			63.9 (100)
Cultivar 1	40.1 (100)	53.5 (100)		
Cultivar 13	39.7 (100)	65.2 (100)	68.9(100)	
Cultivar 20		69.2 (100)	74.7(93)	
Cultivar 21	55.7 (100)	75.6 (97.2)	76.8(96)	
Cultivar 31			52.9(100)	
Cultivar 33	38.4 (100)	64.2 (100)		
Cultivar 47		76.1 (98.8)		76.9 (100)
Cultivar 52		62.4 (100)		76.1 (66.7)
Cultivar 53	66.0 (100)	69.8 (100)		
Cultivar 55	50.9 (100)	67.6 (100)		
Cultivar 56		76.9 (100)		
Cultivar 57				68.2 (97)
LSD* P=0.05	8.7 (3.2)	9.4 (3.8)		9.3 (2.9)

Fry colour was assessed by the USDA chip colour chart. The zero category % fry colour is shown in brackets.

$\phi$  Fry grade yield is > 75grams

+ Fry grade yield is > 100grams

$^{\wedge}$  Fry grade yield is > 80grams

\* LSD = Least significant difference.

### ***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, Sth Australian and Tasmanian trials.

Cultivar 5 is not suited to the early districts of the Riverina. 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 6***

Cultivar 6 is the main early to mid variety used for French fry production in Australia. It has a medium length maturity, which enables it to be used for December, January, and February processing. Cultivar 6 is not stored by McCain Foods (Aust). Cultivar 6 sets only average tubers per plant and can produce larger size tubers which are undesirable for processing.

### ***Cultivar 1***

Cultivar 1 has been used as a check variety for wedge specific variety evaluation. McCain has begun using a small volume of Cultivar 1 to produce wedge size potatoes.

### ***Cultivar 13***

Cultivar 13 has shown very good tuber characteristics over a number of years. It has however shown a high susceptibility to Tomato Spotted Wilt Virus (TSWV) in the plant and more importantly in the tuber, with up to 30% of tubers severely effected (Riverina 2003), it did not have severe canopy symptoms in the Victoria experiment last season (Appendix 1 Table 6) however the infected plant did show tuber symptoms at harvesting. Cultivar 13 did show high plant susceptibility to TSWV in South Australia last season (Appendix 1 Table 5), which expressed itself in the tubers at a similar percentage. Due mainly due to its susceptibility to TSWV we will be no longer testing this cultivar.

### ***Cultivar 21***

Cultivar 21 has been a consistent high yielder and proved this again last season (Table M1). It had excellent shape, dry matter and fry score in the Riverina trial this year, which also applies for Ballarat apart from only a marginal dry matter (Appendix 1 Table 2). This may be an agronomic problem, but with further testing in the Riverina and Ballarat we may be able to manage dry matter levels. Cultivar 21 however had few tubers per plant (Appendix 1 Table 4) and was a large bold sample in the Sth Australian trial, it also showed a slight susceptibility to TSWV

### ***Cultivar 31***

Cultivar 31 showed good tuber shape characteristics but yields were slightly below the check variety (Table M1) in the Sth Australian trial. Dry matter slightly below Russet Burbank (Appendix 1 Table 4) and a slight susceptibility to powdery scab were the negatives with this cultivar. It may be included in future trials in Sth Australia.

### ***Cultivar 47***

Cultivar 47 In its first season in district trials has shown it's potential to have high yields (Table M1) but distorted tubers were of concern in the Tasmanian trial. Tuber size can be larger than ideal for processing (Appendix 1) but this may be managed with spacing the variety closer.

### ***Cultivar 53***

Cultivar 53 has shown its ability to out yield existing varieties (Table M1) with excellent tuber shape and attributes. Tuber size is small to medium but this is not of concern, as tuber numbers can still enable high yields to be achieved, this was the case in the Riverina this season (Appendix 1 Table 1). Cultivar 53 has a longer maturity than Cultivar 5, which may limit it to certain growing areas or times. We will be retesting this cultivar with some spacing adjustments trial work planned, and regard it to have a high potential for commercialisation.

### ***Cultivar 56***

Cultivar 56 Has a high potential yield as can be seen in Table M1. This variety has a longer maturity than Cultivar 5 and can have a larger tuber size (Appendix 1 Table 4). This cultivar will be retested again with some adjustment to plant spacings in an effort to reduce the larger size sample.

## **Technology Transfer**

A Field day was conducted during the harvest of the Victorian trial which members of the McCain Grower Group were invited to attend, along with Department of Primary Industries (Vic) representatives and production personnel from McCain Food processing plant in Ballarat. Attendance and interest in the trial was satisfactory considering the trial was harvested in one of the busiest times for the growers. Ballarat's local grower committee also inspected the trial site during the season.

In addition to the field day in Ballarat, local growers representatives and research personnel were invited to the other 3 trial harvest days. This received a varied response. Confidential results from all trial sites will be presented to each grower group and also to the McCain Foods Variety evaluation Committee

## **Recommendations**

Further evaluation and development of new French fry varieties is required prior to the commercialisation of any cultivar. This season has shown that with the industry groups taking a far greater ownership in variety evaluation and commercialisation of new cultivars, interest in the four 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.

It is envisaged that this project will continue next season in a similar capacity as season 2003-2004. 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 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 his raw product from many different districts.

## References

Williams, C. (2004) Evaluation and development of new potato genotypes in South Australia. Final Report HAL Project No. PT 02009.

## Appendix 1.

New South Wales variety evaluation trial 2003-2004. Riverina (Savernake) is a early delivery district for McCain Foods Ballarat processing plant. Planted in early September, the trial was lifted on the 2<sup>nd</sup> of February 2004.

**Table 1.**

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

Entry	Spacing in Rows cm	Yield, Tonnes per Hectare					Rank by Fry Grade	Tuber No. Per Plant	Quality						
		Chats 0-75g	Small 75-280g	Large 280-450g	Over Size >450g	Fry Grade >75g			Dry Matter %	Fry Colour *					
									0	1	2	3	4	Ends	Tips
Cultivar 1	25.0	6.1	39.8	0.3	0.0	40.1	11	8.9	20.5	100					
Cultivar 2	31.2	2.1	30.0	2.4	0.0	32.4	22	5.8	18.9	100					
Cultivar 3	35.7	2.1	32.4	2.9	0.0	35.3	21	7.4	21.7	100				2.4	2.4
Cultivar 4	35.7	3.0	60.0	6.8	0.0	66.8	1	12.5	23.6	100					
Cultivar 6	31.2	3.7	35.7	4.4	0.0	40.1	11	8.9	18.9	94.4	2.4	2.4		6.4	1.2
Cultivar 8	35.7	3.5	47.3	6.9	0.3	54.5	6	10.6	23.6	100					
Cultivar 13	31.2	4.1	38.0	1.7	0.0	39.7	15	9.5	21.9	100					2.4
Cultivar 14	35.7	5.3	28.7	0.3	0.0	29.0	24	10.2	21.5	100					
Cultivar 21	25.0	2.9	50.0	5.4	0.3	55.7	5	7.5	22	100					
Cultivar 22	38.4	2.4	38.3	1.7	0.0	40.0	14	9	23.4	100					
Cultivar 27	28.0	5.4	52.8	0.5	0.0	53.3	8	11.6	23.6	100					
Cultivar 29	35.7	4.2	57.5	2.6	0.0	60.1	4	13.6	25.5	97.2		1.2	1.2		
Cultivar 32	31.2	9.6	35.4	0.0	0.0	35.4	20	12.5	23.3	100					
Cultivar 33	31.2	5.9	37.2	1.2	0.0	38.4	17	10.7	22.6	100					
Cultivar 38	31.2	2.9	36.1	1.5	0.0	37.6	18	7.5	20.1	98.4		1.2			
Cultivar 41	31.2	2.7	46.3	15.2	2.7	64.2	3	8.9	24.4	100					
Cultivar 42	33.4	4.1	52.6	1.2	0.0	53.8	7	13	25.4	100					
Cultivar 45	31.2	3.0	43.7	5.4	0.0	49.1	10	8.9	20.2	97.2	1.2	1.2		5.2	
Cultivar 49	33.4	3.7	34.7	0.6	0.5	35.8	19	8.9	22.5	100				1.2	10.4
Cultivar 50	31.2	3.0	38.1	1.4	0.0	39.5	16	7.6	23.1	97.2		2.4			
Cultivar 51	33.4	2.4	29.9	1.7	0.0	31.6	23	6.7	19.8	98.4	1.2				
Cultivar 53	28.0	3.7	64.8	1.2	0.0	66.0	2	11.1	24.2	100					
Cultivar 55	31.2	4.5	48.8	1.8	0.3	50.9	9	10.9	22.6	100				1.2	1.2
Cultivar 59	25.0	3.7	36.6	3.5	0.0	40.1	11	6.4	17.9	98.4	1.2			4	
LSD [P=0.05]		1.6	7.4	4.9	0.9	8.7			1.5	3.2					
LSD [P=0.01]		2	9.7	6.4	1.2	11.6			2	4					

\* Fry Colour at harvest (USDA colour chart)

Victorian variety evaluation trial 2003-2004. Ballarat (Learmonth) is the main delivery and storage district for McCain Foods Ballarat processing plant. Planted in mid November, the trial was lifted on the 28<sup>th</sup> of April 2004.

**Table 2.**

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

Entry	Spacing in Rows cm	Yield, Tonnes per Hectare					Rank by Fry Grade	Tuber No. Per Plant	Dry Matter %	Quality					
		Chats 0-75g	Small 75-280g	Large 280-450g	Over Size >450g	Fry Grade >75g				Fry Colour *					
									0	1	2	3	4	Ends	Tips
Cultivar 1	28.0	0.8	17.6	27.3	8.6	53.5	30	6.4	22.6	100					
Cultivar 2	33.4	1.8	29.8	24.8	10.2	64.8	16	10.2	19.2	98.8	1.2				
Cultivar 5	38.4	1.3	25.9	21.0	17.7	64.6	17	11.3	19.4	100					
Cultivar 11	38.4	0.9	20.5	22.6	12.4	55.5	27	8.9	22.3	100					
Cultivar 13	31.2	0.7	19.0	32.3	13.9	65.2	14	6.9	21.0	100					
Cultivar 19	35.7	3.6	39.8	13.5	1.5	54.8	28	15.3	18.9	100					
Cultivar 20	28.0	1.0	24.6	31.0	13.6	69.2	7	7.7	20.8	100					
Cultivar 21	28.0	0.5	20.5	31.6	23.5	75.6	3	7.7	18.6	97.2	2.4				
Cultivar 22	38.4	1.3	36.7	28.1	3.1	67.9	8	13.3	22.0	100					
Cultivar 23	35.7	0.8	31.9	21.2	2.7	55.8	25	9.9	21.3	100					
Cultivar 24	25.0	0.9	23.2	25.1	11.9	60.2	20	6.5	19.2	98.8	1.2				
Cultivar 25	31.2	1.2	38.2	12.4	0.2	50.8	31	9.8	22.2	100					
Cultivar 26	35.7	1.8	26.5	21.3	10.9	58.7	21	10.1	21.0	100					
Cultivar 27	28.0	2.3	41.8	20.7	6.8	69.3	6	11.7	18.7	96	2.4	1.6			
Cultivar 33	31.2	1.3	33.3	24.4	6.5	64.2	18	9.8	21.0	100					
Cultivar 35	33.4	1.2	27.9	25.9	13.6	67.4	10	9.8	19.6	100					
Cultivar 38	31.2	1.7	28.3	16.2	4.2	48.7	32	9.2	23.2	100					
Cultivar 41	28.0	0.8	19.9	30.2	19.8	69.9	4	7.2	21.2	100					
Cultivar 42	31.2	0.8	32.5	23.4	9.2	65.1	15	8.9	21.8	100					
Cultivar 43	28.0	0.7	24.8	25.9	6.8	57.5	23	7.1	24.6	100					
Cultivar 45	31.2	1.0	32.5	26.5	7.9	66.9	11	9.9	19.4	90.8	9.2				
Cultivar 47	28.0	2.6	38	26.9	11.2	76.1	2	11.8	19.5	98.8	1.2				
Cultivar 48	33.4	0.5	19.8	24.2	22.6	66.6	12	7.7	19.1	97.2	1.6	1.2			
Cultivar 49	33.4	1.5	36.5	16.3	2.8	55.6	26	11.2	21.3	98.8	1.2				
Cultivar 50	35.7	0.9	23.3	29.4	13.1	65.8	13	9.5	22.1	98.8	1.2				
Cultivar 51	31.2	1.7	32	19.9	2.2	54.1	29	8.6	19.6	98.8		1.2			
Cultivar 52	31.2	0.8	29.4	23.9	9.1	62.4	19	8.8	22.4	100					
Cultivar 53	28.0	1.0	34.2	21.7	13.9	69.8	5	9.8	21.4	100					
Cultivar 54	35.7	2.6	37.2	18.0	2.6	57.8	22	14.0	21.2	98.8	1.2				
Cultivar 55	31.2	2.3	38.9	19.2	9.5	67.6	9	11.5	20.3	100					
Cultivar 56	31.2	2.3	27.8	28.6	20.5	76.9	1	11.1	20.8	100					
Cultivar 58	33.4	4.7	38.0	16.6	1.7	56.3	24	16.2	21.7	100					
LSD [P=0.05]		1.1	6.0	8.1	6.0	9.4			1.2	3.84					
LSD [P=0.01]		1.4	7.9	10.6	7.9	12.2			1.6	4.96					

\* Fry Colour at harvest (USDA colour chart)

Tasmanian variety evaluation trial 2003-2004.

Devonport district (Forthside) is one of the main delivery and storage district for McCain Foods Smithton processing plant. Planted in late October, the trial was lifted on the 10<sup>th</sup> of May 2004.

**Table 3.**

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

Entry	Spacing in Rows cm	Yield, Tonnes per Hectare					Rank by Fry Grade	Tuber No. Per Plant	Quality							
		Chats 0-80g	Small 80-250g	Large 250-650g	Over Size >650g	Fry Grade >80g			Dry Matter %	Fry Colour *						
										0	1	2	3	4	Ends	Tips
Cultivar 5	32.5	1.2	30.0	30.3	0.6	60.8	11	8.6	23.2	100						7
Cultivar 6	20.0	1.6	19.5	41.8	2.6	63.9	10	4.8	21.8	100						7
Cultivar 28	20.0	1.0	19.5	46.7	0.6	66.8	7	4.5	19.1	67	33					
Cultivar 30	32.5	3.0	33.8	29.4	0.9	64.1	9	10.1	20.7			100				
Cultivar 34	30.0	1.0	23.2	26.6	0.6	50.4	14	6.2	20.3	100						7
Cultivar 36	27.5	1.6	28.6	30.5	0.6	59.7	13	7.1	23.4	100						
Cultivar 37	30	4.3	52.6	11.7	0.0	64.3	8	11.8	21.4	100						
Cultivar 40	25.0	0.9	12.8	48.8	14.6	76.1	2	5.5	23.9	100						
Cultivar 46	32.5	2.2	36.2	35.2	0.0	71.4	5	10.2	24.4	93	7					13
Cultivar 47	22.5	2.6	28.4	43.6	4.9	76.9	1	6.9	21.6	100						7
Cultivar 48	27.5	2.7	30.6	28.6	1.0	60.1	12	7.9	23.2	87	13					7
Cultivar 52	25.0	1.7	40.7	34.5	0.9	76.1	3	8.0	26.5	67	33					
Cultivar 57	22.5	1.3	20.9	45.8	1.6	68.2	6	5.9	21.8	93	7					
Cultivar 60	27.5	2.1	26.8	42.8	3.0	72.5	4	7.9	21.8	87	13					33
LSD [P=0.05]		1.1	8.6	10.1	3.8	12.0		1.5	1.3	3.3						

\* Fry Colour at harvest (USDA colour chart)

South Australian variety evaluation trial 2003-2004.

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 late October, the trial was lifted on the 14<sup>th</sup> April 2004.

**Table 4.**

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

Entry	Spacing in Rows cm	Yield, Tonnes per Hectare					Rank by Fry Grade	Tuber No. Per Plant	Quality							
		Chats	Small	Large	Over Size	Fry Grade > 100g			Dry Matter %	Fry Colour *						
		0- 100g	100- 280g	280-450g	>450g	0				1	2	3	4	Ends	Tips	
Cultivar 5	31.2	6.9	46.2	9.7	9.1	65.0	8	9.9	20.1	96	4				4	4
Cultivar 13	31.2	3.3	48.3	12.6	8.0	68.9	6	8.5	21.3	100						
Cultivar 17	35.7	4.8	47.6	12.8	13.5	73.9	3	11	20.4	100					4	
Cultivar 20	35.7	0.4	25.2	14.2	35.3	74.7	2	7.5	20.4	93	7					
Cultivar 21	28.0	2.2	26.7	18.1	31.8	76.8	1	6.5	19.1	96	4				4	4
Cultivar 22	35.7	4.3	48.7	13.5	8.2	70.3	5	11.2	21.2	100						
Cultivar 24	25.0	3.3	35.9	18.8	18.0	72.7	4	6.3	19.7	96	4					
Cultivar 27	31.2	9.1	38.4	12.1	9.2	59.7	9	10.3	18.6	86	10	4				4
Cultivar 31	31.2	2.9	39.0	6.8	7.0	52.9	12	7.3	19.0	100						4
Cultivar 39	35.7	2.4	46.3	3.5	3.2	53.0	11	7.9	20.7	100						
Cultivar 44	31.2	9.6	47.9	8.4	10.9	67.3	7	12.8	19.7	100						
Cultivar 54	35.7	6.5	42.6	9.9	3.9	56.4	10	11.0	20.2	100						
LSD [P=0.05]		2.7	20.5	8.9	11.3											

\* Fry Colour at harvest (USDA colour chart)

**Table 5.**

Penola replicated trial 2003-2004 Tomato Spotted Wilt Virus canopy infection visual assessment.

Tomato Spotted Wilt Virus Number of plants effected per plot				
VARIETY	Rep 1	Rep 2	Rep 3	Total
Cultivar 5	1	1	3	5
Cultivar 13	4	5	4	13
Cultivar 17	1	1	0	2
Cultivar 20	3	0	0	3
Cultivar 21	1	0	2	3
Cultivar 22	3	4	1	8
Cultivar 24	10	10	14	34
Cultivar 27	0	0	0	0
Cultivar 31	1	0	0	1
Cultivar 39	5	2	0	7
Cultivar 44	2	0	2	4
Cultivar 54	1	0	0	1



**Table 6.**

Ballarat replicated trial 2003-2004 Tomato Spotted Wilt Virus canopy infection visual assessment.

<b>Tomato Spotted Wilt Virus</b>										
<b>Number of plants effected per plot</b>										
	1st inspection 31-12-03			2nd inspection 22-1-04			3rd inspection 10-2-04			
<b>VARIETY</b>	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Total
Cultivar 1	0	0	0	2	1	0	2	1	1	4
Cultivar 2	0	0	0	0	0	0	1	2	1	4
Cultivar 5	0	0	0	0	0	0	0	0	0	0
Cultivar 11	0	0	0	1	0	0	1	1	1	3
Cultivar 13	0	0	0	0	1	0	0	1	1	2
Cultivar 19	0	0	0	0	0	0	0	2	1	3
Cultivar 20	0	0	0	1	1	0	3	1	3	7
Cultivar 21	0	0	0	0	1	0	1	1	1	3
Cultivar 22	0	0	0	0	0	0	1	1	0	2
Cultivar 23	0	0	0	0	0	0	0	1	0	1
Cultivar 24	1	0	2	2	1	4	8	5	5	18
Cultivar 25	0	0	0	0	0	0	0	0	2	2
Cultivar 26	0	0	0	0	0	0	0	1	0	1
Cultivar 27	0	0	0	0	0	0	0	0	1	1
Cultivar 33	0	0	0	0	0	0	0	1	0	1
Cultivar 35	0	0	0	1	1	0	2	1	1	4
Cultivar 38	0	0	0	0	0	0	0	2	0	2
Cultivar 41	0	0	0	0	0	0	0	0	1	1
Cultivar 42	0	0	0	0	0	0	0	0	0	0
Cultivar 43	0	0	0	0	0	0	0	0	1	1
Cultivar 45	0	0	4	0	2	4	3	5	5	13
Cultivar 47	0	0	0	0	0	0	1	0	0	1
Cultivar 48	0	0	0	0	0	0	0	0	1	1
Cultivar 49	0	0	0	0	0	0	0	0	1	1
Cultivar 50	0	0	0	1	0	0	1	0	0	1
Cultivar 51	0	0	0	0	0	0	0	2	0	2
Cultivar 52	0	0	0	0	0	0	0	0	1	1
Cultivar 53	0	0	0	0	0	0	0	1	0	1
Cultivar 54	0	0	0	0	0	0	1	0	0	1
Cultivar 55	0	0	0	2	0	0	2	0	0	2
Cultivar 56	0	0	0	0	0	0	0	0	0	0
Cultivar 58	0	0	0	0	0	0	0	2	1	3