



Know-how for Horticulture™

**Potato variety
evaluation,
commercialisation
and adoption: Interim
project**

Russell Sully
VIC Department of
Primary Industries

Project Number: PT01033

PT01033

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Final Report for Horticulture Australia

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Purpose of Report: To provide the final report on this interim project, which has facilitated the transition to the new model for the national potato improvement program. Under the new model industry will play a much stronger role in evaluation and identification of potato varieties from the national program for commercialisation.

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Media Summary

The future competitiveness and profitability of the Australian potato industry is dependent upon a supply of new varieties adapted to Australian production conditions and markets.

These varieties need to have the quality attributes sought by consumers, be high yielding with efficient use of inputs to have minimum negative impact on the environment.

The National Potato Improvement program funded by Horticulture Australia with industry levies and the Department of Primary Industries Victoria has just released results of evaluation trails. These trials have tested potential new potato lines for the French Fry, Fresh and Crisping sectors, conducted over the last twelve months in five production regions of Southeastern Australia.

The trials look at tuber shape and size suitability for the intended purpose, yield, specific gravity, cooking colour and in some trials resistance to tomato spotted wilt tuber necrosis.

The diversity in regional testing environments and harvest times across the sectors enhances the opportunity for industry to identify varieties suitable for specific market specifications and agronomic conditions.

The dry season in 2002/03 imposed additional selection pressure for lines capable of handling hot dry conditions where some check varieties and lines performed exceptionally well when compared to others in the trials.

The other feature to emerge is that there is considerable variation within the lines in their expression of resistance to tomato spotted wilt virus with some lines showing resistance while others in the trail had 60% of tubers showing necrosis.

It was surprising how many of the fresh check varieties and numbered lines exceeded the borderline crisping cook colour of 6 at harvest across most sites and in this respect many lines were not significantly different to the check varieties.

Further evaluation of these lines will determine their suitability for the three main market segments, French Fry, Fresh and Crisping, and a diverse range of regional production environments throughout the year. The industry from July 2003 will now take responsibility for the further evaluation of these lines to assess their commercial merit and then take responsibility for their commercialisation.

Technical Summary

French fry: There were eight trials conducted at sites which included Ballarat, Toolangi, Berrigan, South Australia loam and sand, aimed at testing, tuber shape and size suitability for French Fry processing, Fry Grade Yield, Specific Gravity and Fry Cook Colour at harvest. These were most commonly compared against check varieties, Russet Burbank, Shepody, Riverina Russet, Ranger Russet, McCain 1 and Stampede.

There were thirteen lines tested that performed better or equal to the check varieties in respect to fry grade yield that had suitable size and shape for French Fry Processing. The variability in performance of the line across the range of environments and soil types indicates that while there is a degree of adaptation to specific sites, some lines appear to be robust by performing reasonable well in a range of conditions.

Line 92-37-1 performed well at Berrigan in both December and January harvest and has shown a degree of tomato spotted wilt virus resistance, good specific gravity and fry colour at harvest.

Line 97-100-1 was a line, which performed well at Berrigan in a January harvest, Ballarat North, Ballarat South and Toolangi, with good specific gravity and fry colour at all sites.

Line 99-4-9 yielded well at Ballarat North, South Australia on loam soil and at Toolangi but was not significantly higher than the check varieties. It had acceptable specific gravity and fry cook colour.

Line 98-96-31 performed well for fry grade yield at Ballart North, Ballart South, Berrigan January harvest and on South Australian loam with very high specific gravity in two trials and acceptable fry colour at harvest, although it did show some susceptibility to tomato spotted wilt virus at Berrigan.

Line 98-102-10 performed well at Ballarat North (Rank No1), South Australian sand and Toolangi with acceptable specific gravity and fry colour at harvest. Other lines, which performed well were 99-48-2 (Rank No 5) South Australian Sand, and 99-9-25 (Rank No 1) Toolangi.

All these line need closer scrutiny by the French Fry sector to assess their commercial suitability.

Fresh: Four fresh trials were conducted in the South Australian Mallee with winter harvests in 2002 and 2003 and two trials at Toolangi for harvest in 2003. The check varieties used were Coliban, Luster, Nadine, Desiree, Ida Rose, Shine, Fontenot, Winter Gem, Ruby Lou and Sebago. Over the entire fifty tests of check varieties and numbered lines, thirty-three had suitable attributes for the fresh washed market.

A number of lines performed equally as well for No 1 grade yield as the best check varieties, however, crisp colour was generally darker than 6 and unacceptable for a number of check and numbered lines across all sites and harvests with exceptions for a few lines.

The outstanding fresh line for No 1 grade yield was 95-95-13 ranked one in the SA Mallee trial in 2002 and Toolangi A in 2003 and significantly higher yield in both trials than the check varieties.

The other outstanding line for No 1 grade yield was 95-97-9, ranked 2 in the SA Mallee 2002 trial where it was significantly different to the check varieties and ranked 4 in the Toolangi A 2002 trial, although it was not significantly different to the check varieties in this trial.

Both lines, 95-95-13 and 95-97-9, had dark crisp cook colour in the tests at both sites.

The SA Mallee 2003 trial was drought affected and the adjoining crop was replanted but in spite of the tough condition some lines including the check variety Coliban still yielded in the range of 27 to 31 t/ha compared with Luster and Nadine around 7t/ha.

Crisp: Four crisp trials were conducted at Berrigan December harvest, Berrigan January harvest, Koo Wee Rup and Toolangi using the check varieties Atlantic, Trent, Denali, Simcoe, ATX85404-8, Snowden and FL1867. Across the four trials, in total thirty-one varieties and numbered lines show suitable tuber shape and size for processing into crisps.

A number of lines performed equally well in respect to crisp grade yield as Atlantic, 99-34-1, 99-34-12, 93-6-3, 99-35-14, 98-20-42, 99-78-6, 99-78-52, 98-54-54, 97-59-218 and 97-59-16 and all generally had very good crisp colour and specific gravity within the range of the check varieties and level of acceptability for commercial use.

The most out-standing line in respect to yield was 98-54-54 with a yield of 69.2 t/ha, although this was not significantly different to the check varieties Atlantic and Snowden it out-yielded the other check varieties.

General Comments: The diversity in regional testing environments and harvest times across the sectors enhances the opportunity for industry to identify varieties suitable for specific market specifications and agronomic conditions.

The dry season in 2002/03 imposed additional selection pressure for lines capable of handling hot dry conditions where some check varieties and lines performed exceptionally well when compared to others in the trials.

The other feature to emerge is that there is considerable variation within the lines in their expression of resistance to tomato spotted wilt virus with some lines showing resistance while others in the trial had 60% of tubers showing necrosis.

It was surprising how many of the fresh check varieties and numbered lines exceeded the borderline crisping cook colour of 6 at harvest across most sites and in this respect there many lines were not significantly different to the check varieties.

Recommendations: An enhanced data management, analysis and interpretation system needs to be developed to streamline the processing of evaluating new lines against the check varieties. This system should support comparisons across trials and years to build up better information on the merit of the parent lines used and to support better predictions of progeny performance.

The data from these trials should be used by industry along with field observations and market knowledge for selecting new varieties for release and commercialisation.

The breeding and evaluation criteria for each sector need to be more clearly defined to help focus the breeding, screening and evaluation of new lines to enhance the chances of success by narrowing the focus of the program.

Considerations should be given to screening at G3 stage in environments other than Toolangi to increase the environmental pressure on genotypes and bring these conditions more in line with commercial production regions.

Introduction

The effective development, commercialisation and adoption of potato varieties for Australian environments and markets require commitment and input from key stakeholders in the production/demand chain. Increasingly the global food industry is developing integrated supply chains to ensure that product flows effectively through to consumers which is the highest possible and consistent quality, competitively priced, safe and good to eat. Plant and potato varieties are increasingly part of the value offer to consumers by retail outlets and their supply chains, as they become an integral part of the "brand offer".

New potato varieties need to be developed, evaluated and commercialised within this industry context. Their commercialisation and adoption relies upon them meeting the requirements for cost and quality of each sector or customer of the production/demand chain.

In the past the adoption and commercialisation of new varieties from the breeding program has been less than optimal. There has been limited scope for companies and organisation to be involved in defining breeding and evaluation criteria, limited scope to participate in the process and more importantly capture any benefit from investment in the development and commercialisation of new varieties as commercialisation rights could not be assigned.

This project has continued the evaluation of varieties from the breeding program while discussions were held with industry sectors aimed at reaching agreement about the process for evaluation and commercialisation of varieties from the breeding program including input into the breeding and screening stages.

Throughout the project discussions have been held between Horticulture Australia, Department of Primary Industries the processing companies as a group and individually with each of the four main companies.

For the fresh sector discussions have been held between Horticulture Australia, Department of Primary Industries and the group now know as the Fresh National Evaluation Committee representing each of the main potato production states.

Agreement has been reached with the processing and fresh sectors that will form the basis for a program charter document, which is being drafted, which collates policies, procedures, roles and responsibilities of all parties.

Materials and Methods

Meetings have been convened with each of the major stakeholders to discuss the future framework for input into establishing breeding and evaluation criteria, management and funding of evaluation, process for assigning commercialisation rights and issues associated with commercialisation for new varieties from the program.

Protocols have been established for evaluation of varieties from G4 trials and beyond and feedback to the breeding program.

Replicated evaluation trials have been conducted to assess yield grade, tuber numbers per plant, quality (specific gravity, cooking colour at harvest and after post harvest storage) and disease resistance to Tomato Spotted Wilt Virus (TSWV)*, variety description and observations about tuber shape, skin and growth habits. Below is a list of the evaluation trials conducted and harvest times.

* Resistance to TSWV was observed by noting disease occurrence in the field rather than by non-occurrence after disease pressure was applied

The following evaluation trials were conducted:

French-fry G4

Berrigan	December harvest 2002
Berrigan	January harvest 2003
Ballarat Nth.	Autumn harvest 2002/03
Ballarat Sth	Storage 9°C post harvest cooking 2002/03
Penola sand	Autumn harvest 2002/03
SA sand	Storage 9°C post harvest cooking tests 2002/03
SA Loam	Autumn harvest 2002/03
SA Loam	Storage 9°C post harvest cooking tests 2002/03
Toolangi	Senior A Autumn harvest 2002/03
Toolangi	Senior A Storage 9°C post harvest cooking tests 2002/03
Toolangi	Senior B Autumn harvest 2002/03
Toolangi	Senior B Storage 9°C post harvest cooking tests 2002/03

Fresh G4

SA Mallee	Winter harvest 2003
SA Mallee	Winter harvest 2002
Toolangi	Senior fresh A Autumn harvest 2002/03
Toolangi	Senior fresh B Autumn harvest 2002/03

Crisping G4

Berrigan	December harvest 2002
Berrigan	January harvest 2003
Koo Wee Rup	May harvest 2003
Toolangi	April harvest 2003
	Storage 9°C post harvest cooking tests 2003

Results

The full trial results and data for each site for French Fry, Crisping and Fresh are contained in the appendices. Lines with their identification marked in bold had suitable tuber shape and size for the market sector being evaluated for.

French Fry Berrigan December Harvest 2002

Three check varieties Ranger Russet, Riverina Russet and Shepody have been used to test seven lines for processing shape and yield grade. Of the seven lines tested three have suitable shape for processing and are summarised below Table I.

Table I.

Line No	Yield Fry Grade t/ha >75g	Rank by Fry Grade Yield	Specific Gravity*	% Fry Colour @ Harvest (USDA chart)					
				0	1	2	3	4	E
Ranger Russet	35.3a	6	1.090a	100%					
Riverina Russet	39.6ab	5	1.101bc	100%					
Shepody	42.3b	2	1.088a	100%					
92-37-1	45.6b	1	1.096b	100%					
96-139-14	33.5a	8	1.099bc	100%					
98-109-1	39.8ab	4	1.099bc	100%					
LSD P=0.05	6.5		0.003						
LSD P=0.01	8.9		0.005						

* Specific Gravity (SG) = Wt.Air/(Wt.Air-Wt.Water)

Note: Values followed by same letter are not significantly different ($P=0.05$) for each Line No in respect to Yield Fry Grade and Specific Gravity.

These results in Table I. show that Shepody and 92-37-1 had greater Fry Grade yield than Ranger Russet, but was not significantly different to Riverina Russet. Line 92-37-1 had higher SG (1.096) than check varieties, Shepody, and Ranger Russet but was not significantly different to Riverina Russet. All lines had satisfactory fry colour tested at this harvest.

French fry Berrigan January Harvest 2003

The check varieties used in this trial were Ranger Russet, Riverina Russet and Shepody. Of the thirteen lines tested five numbered lines and Riverina Russet had suitable tuber shape for processing and they are summarised and marked with bold in Table II.

Table II

Line No	Fry Grade Yield t/ha >75g	Rank by Fry Grade Yield	Specific Gravity*	% Fry Colour @ Harvest (USDA chart)					
				0	1	2	3	4	E TSWV#
Ranger Russet	42.0a	9	1.072a	100% 50%10.6%					
Riverina Russet	46.4a	6	1.079abc	100% 33.6%					
Shepody	46.2a	7	1.078ab	100% 18.7%					
92-37-1	52.0a	3	1.085bcef	100% 0.0%					
96-139-14	30.5b	15	1.090ef	100% 4.4%					
97-100-1	53.0a	2	1.084bce	100% 36.6%					
98-96-31	41.0a	11	1.087bcef	100% 19.4%					
99-33-46	49.4a	4	1.090ef	100% 24.4%					
LSD P=0.05	17.4		0.009						
LSD P=0.01	23.4		0.013						

*Specific Gravity (SG) = Wt.Air/(Wt.Air-Wt.Water)

#% Of tubers showing necrosis caused by Tomato Spotted Wilt Virus

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for Yield Fry Grade yield and Specific Gravity.

The Fry Grade Yield was not significantly higher than the check varieties although 96-139-14 was significantly lower yield (30.5t/ha) than all other lines tested. Ranger Russet had lower specific gravity than all the tested lines. Lines 96-139-14 and 99-33-46 both had significantly higher SG (1.090) than all the check varieties. All lines had 100% Fry Colour 0 at harvest.

Line 92-37-1 ranked No 3 for Fry Grade yield had no necrosis caused by Tomato Spotted Wilt Virus, while all other lines in the trial were effected. Line 92-37-1 had higher specific gravity (1.085) than all the check varieties.

French Fry Ballarat North 2002/03

The check varieties used in this trial were McCain 1, Russet Burbank, Stampede, ATX84706-2YR and TX1385-12RU. Of the twenty-seven lines tested, eleven numbered lines (in bold) and McCain 1, had suitable tuber shape for processing. The trial results of these lines are summarised in Table III.

Table III

Line No	Fry Grade Yield t/ha >75g	Fry Grade Yield Ranking	Specific Gravity*	% Fry Colour at Harvest (USDA chart)						
				0	1	2	3	4	E	
McCain 1	54.5ab	5	1.076ab	100%						7%
Russet Burbank	51.5ab	15	1.084b	100%						
Stampede	51.9ab	13	1.085b	93%	7%					
ATX84706-2RY	51.7ab	14	1.071a	100%						
TX1385-12RU	55.0ab	3	1.081b	100%						
96-139-14	48.2a	23	1.092c	100%						
97-100-1	53.7ab	6	1.089bc	100%						
98-102-10	57.3ab	1	1.079b	93%		7%				
98-109-1	51.2ab	16	1.084b	100%						
98-33-24	48.8a	20	1.081b	100%						
98-96-15	50.1ab	18	1.078b	100%						
98-96-31	53.5ab	9	1.087bc	100%						
99-4-3	43.5c	28	1.087bc	100%						
99-4-9	53.6ab	7	1.083b	100%						
99-9-25	52.7ab	10	1.089bc	100%						
99-67-7	50.1ab	17	1.087bc	100%						
LSD P=0.05	7.8		0.006							
LSD P=0.01	10.4		0.008							

*Specific Gravity = $Wt.Air/(Wt.Air-Wt.Water)$

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for Yield Fry Grade and Specific Gravity.

The lines tested in this trail, apart from 99-4-3 all had Fry Grade Yields, which were not significantly different to the check varieties. The only check variety with suitable shape and size McCain 1, had lower specific gravity than 96-139-14. There was no other difference in specific gravity.

French Fry Ballarat South 2002/03

The check varieties used in this trial were McCain 1, Russet Burbank, Stampede, ATX 84706-2RY and TX 1385-12RU. Of the twenty-seven lines tested seven had suitable shape for processing and are marked bold in full list of trial results contained in the appendices. Table IV summaries the Fry Grade yields, Rank by Fry Grade, specific gravity and fry cook colour results for this trial.

Table IV

Line No	Fry Grade Yield t/ha >75g	Fry Grade Yield Ranking	Specific Gravity*	% Fry Colour at Harvest (USDA chart)					
				0	1	2	3	4	E
McCain 1	46.3ab	28	1.078b	100%					
Russet Burbank	52.0ab	17	1.088de	97% 3%			10%		
Stampede	53.7b	12	1.092ef	77% 23%					
ATX84706-2RY	48.1ab	22	1.071a	100%			13%		
TX1385-12RU	50.0ab	19	1.083cd	100%					
95-109-6	54.6be	9	1.097g	100%					
96-139-14	43.4a	32	1.096fg	100%					
97-100-1	61.8cde	1	1.084cd	100%					
98-96-15	54.8b	8	1.083cd	97% 3%					
98-96-31	57.1cde	4	1.091ef	97% 3%					
98-102-10	51.7ab	18	1.083cd	100%					
99-67-18	47.1ab	26	1.088de	97% 3%			7%		
LSD P=0.05	8.7		0.004						
LSD P=0.01	11.6		0.006						

*Specific Gravity = Wt.Air/(Wt.Air-Wt.Water)

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for Yield Fry Grade and Specific Gravity.

These results show that 97-100-1 was the only line that had significantly higher fry grade yield (61.8 t/ha) than all the check varieties, higher specific gravity than McCain 1 and other check varieties other than Russet Burbank. Numbered line 98-96-31 also had higher fry grade yield than the check varieties and specific gravity which was significantly higher than McCain 1 and equivalent to Russet Burbank and Stampede.

There was some variability in the fry colour cooking test at harvest of the lines tested, although the high yielding line 97-100-1 did have 100% 0 rating Fry Colour at harvest.

French Fry Penola Sand 2002/03

The check varieties used in this trial were Russet Burbank, Stampede, ATX 84706-2RY and TX 1385-12RU. Of the twenty-four lines tested eight had suitable shape for processing and are marked bold in the full list of trial results contained in the appendices. Table V summaries the Fry Grade Yields, Rank by Fry Grade, specific gravity and fry cook colour results for this trial.

Table V

Line No	Fry Grade Yield t/ha >100g	Fry Grade Yield Ranking	Specific Gravity*	% Fry Colour at Harvest (USDA chart)					
				0	1	2	3	4	E
Russet Burbank	43.1ab	17	1.073	100%					3%
Stampede	47.7b	9	1.075	100%					
ATX84706-2RY	48.6b	7	1.068	97%	3%				
TX1385-12RU	48.6b	8	1.063	100%					3%
96-139-14	41.0ab	19	1.072	97%	3%				3%
97-100-1	44.1ab	15	1.075	100%					
98-33-24	41.1ab	18	1.069	97%	3%				17%
98-66-7	47.2b	10	1.067	100%					
98-102-10	62.0ef	1	1.072	100%					3%
99-4-3	32.3a	25	1.076	100%					
99-48-2	52.5bf	5	1.076	100%					
99-67-7	45.0ab	14	1.071	100%					
LSD P=0.05	13.0		**						
LSD P=0.01	17.3		**						

*Specific Gravity = Wt.Air/(Wt.Air-Wt.Water) ** Not available

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for Yield Fry Grade and Specific Gravity.

Line 98-102-10 has significantly higher Fry Grade Yield (62.0t/ha) than the check varieties and the entire test lines, other than 99-48-2, and was the out standing performer in this trial.

French Fry Penola Loam 2002/03

The check varieties used in this trial were Russet Burbank, Stampede, ATX 84706-2RY and TX 1385-12RU. Of the twenty-four lines tested seven had suitable shape for processing and are marked bold in full list of trial results contained in the appendices. Table VI summaries the Fry Grade Yields, Rank by Fry Grade, specific gravity and fry cook colour results for this trial.

Table VI

Line No	Fry Grade Yield t/ha >100g	Fry Grade Yield Ranking	Specific Gravity*	% Fry Colour at Harvest (USDA chart)					
				0	1	2	3	4	E
Russet Burbank	66.3bc	6	1.086cdefg	100%					7%
Stampede	59.6abc	10	1.087defgh	93%	7%				3%
ATX8406-2RY	62.8abc	8	1.070a	100%					
TX1385-12RU	54.7abc	17	1.076ab	100%					
97-100-1	49.7ab	23	1.083cde	100%					
98-96-31	69.8bc	2	1.093h	97%	3%				
98-102-20	66.2bc	7	1.085cef	100%					
99-2-13	57.6abc	14	1.089efg	100%					
99-4-9	68.0bc	4	1.082bd	100%					
99-48-2	55.3abc	16	1.080bc	100%					
99-67-7	53.9abc	19	1.087defg	100%					
LSD P=0.05	16.0		0.006						
LSD P=0.01	21.3		0.009						

*Specific Gravity = Wt.Air/(Wt.Air-Wt.Water)

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for Yield Fry Grade and Specific Gravity.

None of the number lines in this trial achieved significantly higher yield than the check varieties although three lines, 98-96-31, 98-102-20 and 99-4-9, achieved very high yield of greater than 60t/ha and specific gravity was comparable with the check varieties and fry colour was acceptable. Line 98-102-20 had significantly higher sg (1.093) of all the other lines apart from the check variety Stampede.

French Fry Senior Toolangi Trail A 2002/03

The check varieties used in this trial were McCain 1, Russet Burbank, Stampede, ATX 84706-2RY and TX 1385-12RU. Of the nineteen lines tested five had suitable shape for processing and are marked bold in full list of trial results contained in the appendices. Table VII summarises the Fry Grade yields, Rank by Fry Grade, specific gravity and fry cook colour results for this trial.

Table VII

Line No	Fry Grade Yield t/ha >75g	Fry Grade Yield Ranking	Specific Gravity*	% Fry Colour at Harvest (USDA chart)					
				0	1	2	3	4	E
McCain 1	45.7abc	19	1.071b	100%					
Russet Burbank	51.6cde	12	1.081efg	100%					3%
Stampede	52.0def	10	1.075bc	73% 27%					
ATX84706-2RY	50.8bcd	14	1.061a	100%					
TX1385-12RU	44.7a	21	1.077bcdef	100%					
96-139-14	44.8ab	20	1.088h	100%					
97-100-1	59.1h	4	1.075bcd	100%					
98-102-10	56.6defgh	7	1.073bc	100%					10%
98-109-1	58.5gh	6	1.085gh	100%					
98-33-24	54.2defg	9	1.076bcde	100%					
LSD P=0.05	6.0		0.005						
LSD P=0.01	7.9		0.007						

*Specific Gravity = $\text{Wt. Air} / (\text{Wt. Air} - \text{Wt. Water})$

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for Yield Fry Grade and Specific Gravity.

The two numbered lines 97-100-1 and 98-109-1 yielded significantly higher fry grade yield than all the check varieties with yields of 59.1t/ha and 58.5t/ha respectively and were two stand out performers. The specific gravity of 97-100-1 was significantly lower than Russet Burbank but not significantly different to the other check varieties apart from ATX84706-2YR, which had a significantly lower SG of 1.061. Line 98-109-1 had significantly higher SG (1.085) than all the check varieties other than Russet Burbank. Fry colour was very good apart from the check variety Stampede that only had 73% 0 rating.

French Fry Senior Toolangi Trail B 2002/03

The check variety used in this trial was Russet Burbank. Of the fifteen lines tested six had suitable shape for processing and are marked bold in full list of trial results contained in the appendices. Table VIII summaries the Fry Grade Yield, Rank by Fry Grade, specific gravity and fry cook colour results for this trial.

Table VIII

Line No	Fry Grade Yield t/ha >75g	Fry Grade Yield Ranking	Specific Gravity*	% Fry Colour at Harvest (USDA chart)					
				0	1	2	3	4	E
Russet Burbank	53.5bc	7	1.082bcd	97%	3%				3%
99-4-9	55.8bcde	4	1.081bcd	100%					
99-9-13	50.0b	9	1.083cd	100%					
99-9-25	61.5e	1	1.079ab	93%	7%				
99-48-2	37.0a	14	1.076a	100%					
99-67-7	54.8bcd	6	1.080bc	100%					
99-70-19	57.1cde	2	1.084d	100%					
LSD P=0.05	6.4		0.003						
LSD P=0.01	8.6		0.004						

*Specific Gravity = Wt.Air/(Wt.Air-Wt.Water)

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for Yield Fry Grade and Specific Gravity.

Line 97-100-1 was the only line with significantly higher Fry grade yield that the check variety Russet Burbank in this trial at 61.5t/ha and there was no difference in its specific gravity. Fry colour was 93% rating 0 and 7% rating 1.

Fresh SA Mallee Winter Harvest 2003

The check variety used in this trial was Coliban, Lustre and Nadine. Of the twenty five lines tested six had suitable shape for the fresh washed market are marked bold in full list of trial results contained in the appendices. Table IX summaries the No 1 Grade Yield, Rank by No 1 Grade, specific gravity and fry cook colour results for this trial.

Table IX

Line No	No 1 Grade Yield t/ha 70-450g	Rank by No 1 Grade Yield	Specific Gravity	Crisp Colour #
Coliban	27.1d	5	1.064c	7.7bc
Lustre	7.4ab	22	1.063c	8.0bc
Nadine	7.8ab	20	1.058a	9.7c
95-95-13	16.9bc	12	1.059bc	7.3ab
96-30-9	4.9a	24	1.061abc	8.3c
96-32-19	27.1d	4	1.062bc	7.0ab
97-9-10	28.2d	3	1.059ab	7.3ab
98-31-7	31.4d	2	1.062b	6.3a
99-10-8	20.9c	7	1.058a	7.3b
LSD P=0.05	9.5		0.003	2.0
LSD P=0.01	12.7		0.004	2.7

Samples assessed visually, scale 1-10, 6 borderline, >6 = too dark.

*Specific Gravity = Wt.Air/(Wt. Air-Wt.Water).

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for No 1 Grade Yield and Specific Gravity and Crisp Colour.

This trial was affected by very hot dry conditions at planting in January 2003, as was the surrounding crop, which had to be re-sown. The check variety Coliban performed the best of the check varieties while three lines, 96-32-19, 97-9-10 and 98-31-7, performed equally as well for No1 Grade Yield. The Crisping colour of all samples was darker than desirable ie greater than 6.

Fresh SA Mallee Winter Harvest 2002

The check varieties used in this trial were Coliban, Desiree, Lustre and Nadine, Ida Rose, Shine, Winter Gem, Ruby Lou and Luster (92-19-10). Of the seven lines tested five had suitable shape for the fresh washed market and are marked bold in full list of trial results contained in the appendices. Table X summaries the No 1 Grade Yield, Rank by No1 Grade, specific gravity and Crisp colour cook results for this trial.

Table X

Line No	No 1 Grade Yield t/ha 70-450g	Rank by No 1 Grade Yield	Specific Gravity*	Crisp Colour ##
Coliban	24.5ab	15	1.066bcd	9.0
Desiree	33.5de	9	1.072g	8.0
Nadine	32.0cd	11	1.053a	10.0
Ida Rose	22.6a	16	1.064b	9.0
Shine	35.0de	5	1.072g	9.0
Fontenot	32.0c	11	1.080h	8.0
Winter Gem	27.4abc	14	1.066bcd	8.0
Ruby Lou	33.5d	9	1.070efg	7.0
Luster 92-19-10	34.3de	6	1.067cdef	9.0
93-37-3	34.1de	7	1.063b	9.0
95-95-13	53.2g	1	1.063b	9.0
95-97-9	43.8f	2	1.068def	7.0
97-9-10	36.4de	4	1.067cdef	7.7
LSD P=0.05	4.8		0.003	
LSD P=0.01	6.5		0.004	

Samples assessed visually, scale 1-10, 6 borderline, >6= too dark.

*Specific Gravity = Wt.Air/(Wt. Air-Wt.Water).

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for No 1 Grade Yield and Specific Gravity and Crisp Colour.

All of the numbered lines out yielded Coliban in this trial with 95-95-13 and 95-97-9 producing significantly higher No 1 Grade yield than any of the named lines, including Desiree, with yields of 53.2 and 43.8 t/ha respectively. All lines tended to have dark crisp cook colour dark across the whole trial. Specific gravity tended to be low across the lines and was significantly different between some of the lines and check varieties.

Fresh Toolangi Senior A Trial 2002/03

The check varieties used in this trial were Coliban, Luster, Nadine, Sebago, and Shine. Winter Gem with ten lines, of the twenty-one tested lines having suitable attributes for the fresh washed market. Those suitable for the fresh washed market are marked in bold. The appendix has full results from the trial. Table XI summaries the results of fresh No1 grade yield t/ha, ranking, specific gravity and crisp cook colour.

Table XI

Line No	No 1 Grade Yield t/ha 70-450g	Rank by No 1 Grade Yield	Specific Gravity*	Crisp Colour ##
Coliban	61.0ghi	3	1.074efg	7.3fghi
Luster	44.8abc	20	1.074efg	5.7cdefg
Nadine	46.3abcde	17	1.063a	9.0i
Sebago	55.5fghi	11	1.071cdef	4.7bcde
Shine	59.7ghi	5	1.072cdefg	2.7a
Winter Gem	44.5ab	21	1.072cdefg	4.7abcde
95-90-2	53.9defgh	12	1.075fg	4.3abcd
95-95-13	61.9i	1	1.065ab	7.7ghi
95-97-9	60.2ghi	4	1.069bcd	6.7efgh
96-30-9	57.9fgh	9	1.072cdefg	6.7efgh
96-101-2	42.8a	22	1.076g	4.7abcde
96-109-2	46.0abcd	19	1.072cdefg	7.7gh
96-102-10	50.4abcdef	15	1.070cde	3.0ab
97-9-10	58.8abcdef	6	1.069cd	5.3cdef
98-31-7	58.1fghi	8	1.070cde	4.7abcde
98-83-3	53.7defg	14	1.068bc	3.7abc
LSD P=0.05	7.7		0.004	2.1
LSD P=0.01	10.3		0.006	2.8

##Samples assessed visually, scale 1-10, 6 =borderline, >6= too dark.

*Specific Gravity = Wt.Air/(Wt.Water-Wt.Water)

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for No 1 Grade Yield and Specific Gravity and Crisp Colour.

A feature of this trial was the high yield of several of the numbered lines although they were not significantly different to the check varieties Coliban, Sebago and Shine, which also had high yield in the range of 55 to 61 t/ha. Specific gravity was satisfactory for fresh market use although a number of lines had dark crisping colour (greater than 6) including the check varieties.

Fresh Toolangi Senior Trail B 2002/03

The check varieties used in this trail were Coliban, Desiree (red), Pontiac (red), Ruby Lou (red), and Sebago with seven lines, of the twenty two tested lines having suitable attributes for the fresh washed market. Those suitable for the fresh washed market are marked in bold. The appendix has full results from the trial. Table XII summaries the results of fresh No 1 grade yield t/ha, ranking, specific gravity and crisp cook colour.

Table XII

Line No	No 1 Grade Yield t/ha 70-450g	Rank by No 1 Grade Yield	Specific Gravity*	Crisp Colour ##
Coliban	57.1ab	14	1.068bcdef	7.0cdef
Desiree (red)	60.9b	6	1.082j	6.0abcde
Pontiac (red)	59.4ab	7	1.064b	9.0f
Ruby Lou (red)	56.3ab	16	1.081j	3.3a
Sebago	58.2ab	10	1.071ef	4.7abc
99-10-8	61.0b	5	1.065bc	4.0ab
99-17-2	57.3ab	12	1.073fgh	7.7def
99-20-3	57.8ab	11	1.066bcd	9.0f
99-52-1 (red)	62.2b	2	1.072efg	5.3abcd
99-52-2 (red)	56.0ab	17	1.074fghi	5.3abcd
99-74-27	50.5a	19	1.059a	6.7bcdef
99-79-1	61.8b	4	1.071ef	6.7bcdef
LSD P=0.05	9.1		0.004	2.7
LSD P=0.01	12.2		0.006	2.0

##Samples assessed visually, scale 1-10, 6 =borderline, >6= too dark.

*Specific Gravity = Wt.Air/(Wt.Water-Wt.Water)

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for No 1 Grade Yield and Specific Gravity and Crisp Colour.

The numbered lines performed similarly to the check varieties in respect to No 1 Grade yield with yields in the range of 56 to 61.8t/ha apart from 99-74-27 which had significantly lower yield than Desiree but was not significantly different to the other check varieties. The crisping colour varied across the check and numbered lines with a number having unacceptably dark crisping cook colour greater than 6. Specific gravity varied across the trial from a low of 1.059 to a high of 1.081 with significant differences between some numbered lines and check varieties.

Crisp Trial Berrigan December Harvest 2002

The check varieties in this trial were Atlantic and Trent with five of the twelve number lines tested showing suitable shape for processing are marked bold. The appendix has full results from the trial. Table XIII summaries the results of Crisp grade yield t/ha, ranking, specific gravity and crisp cook colour.

Table XIII

Line No	Crisp Grade Yield t/ha 45-85 mm	Rank by Crisp Grade Yield	Specific Gravity*	Crisp Colour##
Atlantic	40.1d	2	1.100a	3.7abcd
Trent	23.2a	14	1.105abc	2.7ab
97-59-21	32.2b	7	1.112d	2.3a
98-54-54	33.6bc	6	1.106abc	4.0bcd
99-30-4	32.2b	7	1.111cd	3.0abc
99-34-1	40.8d	1	1.101ab	3.3abcd
99-34-12	36.1bcd	5	1.105abc	4.7d
P=0.05	6.2		0.006	1.5
P=0.01	8.6		0.008	2.0

##Samples assessed visually, scale 1-10, 6 =borderline, >6= too dark.

*Specific Gravity = Wt.Air/(Wt.Water-Wt.Water)

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for No 1 Grade Yield and Specific Gravity and Crisp Colour.

The line 99-34-1 performed equally as well as the high yielding check variety Atlantic with a yield of 40.8t/ha, and there was no significant difference in specific gravity or crisp colour. All tested lines had acceptable Crisp Colour.

Crisp January Harvest Berrigan 2003

The check variety in this trial was Atlantic with two of the six numbered lines tested showing suitable shape for processing which are marked bold. The appendix has full results from the trial. Table XIV summaries the results of Crisp grade yield t/ha, ranking, specific gravity and crisp colour.

Table XIV

Line No	Crisp Grade Yield t/ha 45-85 mm	Rank by Crisp Grade Yield	Specific Gravity*	Crisp Colour##
Atlantic	47.5a	2	1.085a	3.0a
93-6-3	54.1a	1	1.093b	5.3b
99-35-14	47.6a	3	1.087a	2.3a
LSD P=0.05	11.6		0.005	1.4
LSD P=0.01	16.3		0.007	1.9

##Samples assessed visually, scale 1-10, 6 =borderline, >6= too dark.

*Specific Gravity = Wt.Air/(Wt.Water-Wt.Water).

Notes: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for Crisp Grade Yield and Specific Gravity and Crisp Colour.

There was no significant difference between Atlantic and the two numbered lines, which had suitable shape for crisping. However, 93-6-3 had significantly higher specific gravity than Atlantic and the other numbered line. Although its crisp colour was significantly darker than Atlantic it was still acceptable.

Crisp Trial Koo Wee Rup 2002/03

The check varieties in this trial were Atlantic, Denali, Simcoe, Trent and ATX85404-8 with eleven of the nineteen numbered lines tested, showing suitable shape for processing that are marked in bold. The appendix has full results from the trial. Table XV summaries the results of Crisp grade yield t/ha, ranking, specific gravity and crisp colour.

Table XV

Line No	Crisp Grade Yield t/ha 45-85 mm	Rank by Crisp Grade Yield	Specific Gravity*	Crisp Colour##
Atlantic	43.7hij	3	1.077cde	3.3abcd
Denali	39.0defgh	7	1.077cde	3.3abcd
Simcoe	28.6a	21	1.077cde	2.7ab
Trent	32.1abc	17	1.079defg	2.7ab
ATX85404-8	40.0fghi	5	1.073ab	2.7ab
93-6-3	47.5j	1	1.071a	2.7ab
97-24-1	32.8abcd	16	1.084h	3.7abcd
97-59-16	36.4bcdefg	11	1.078cdef	2.7ab
98-12-24	36.9bcdefg	9	1.077de	2.7ab
98-20-42	45.2hij	2	1.075bc	3.0abc
99-12-6	33.0abcde	15	1.076bcd	2.3a
99-14-10	30.9ab	18	1.088i	3.0abc
99-34-12	36.6bcdefg	4	1.075bc	4.7d
99-78-6	39.2efgh	6	1.079deg	2.7ab
99-78-9	34.2abcdef	13	1.087i	2.7ab
99-78-52	37.0cdefg	8	1.081fgh	2.3a
LSD P=0.05	6.2		0.003	1.6
LSD P=0.01	8.3		0.004	2.2

##Samples assessed visually, scale 1-10, 6 =borderline, >6= too dark.

*Specific Gravity = Wt.Air/(Wt.Water-Wt.Water).

Notes: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for Crisp Grade Yield and Specific Gravity and Crisp Colour.

The highest ranked lines 93-6-3 had significantly higher crisp grade yield than the all the check varieties other than Atlantic, while second ranked line 98-20-42 had higher yield than check varieties Simcoe and Trent.

Line 93-6-3 had lower specific gravity than the check varieties while 98-20-42 was not significantly different. All lines tested had acceptable Crisp cooking colour.

Crisp Senior Trial Toolangi 2002/03

The check varieties in this trial were Atlantic, Denali, Simcoe, Snowden, Trent, ATX85404-8 and FL 1867 with eight of the nineteen numbered lines tested showing suitable shape for processing are marked bold. The appendix has full results from the trial. Table XVI summaries the results of Crisp grade yield t/ha, ranking, specific gravity and crisp colour.

Table XVI

Line No	Crisp Grade Yield t/ha 45-85 mm	Rank by Crisp Grade Yield	Specific Gravity*	Crisp Colour##
Atlantic	65.0fghi	4	1.081bc	5.0bcde
Denali	57.7cdefg	13	1.091fg	6.7
Simcoe	47.5ab	24	1.090fg	5.3bcdef
Snowden	67.5i	2	1.086cdef	5.0bcde
Trent	52.3bcd	19	1.086cdef	5.0bcde
ATX85404-8	64.0fghi	5	1.074a	4.3b
FL 1867	53.2bcde	16	1.095g	4.0a
97-59-16	58.8cdefg	12	1.086cdef	5.3bcde
97-59-218	60.8efghi	9	1.082bcd	5.0bcde
98-54-54	69.2i	1	1.082bcd	5.5cdef
99-30-4	51.6bc	21	1.079ab	4.0a
99-34-1	56.7cdef	14	1.079ab	4.7bcd
99-35-14	41.0a	29	1.084bcde	4.5bc
99-78-6	61.4efghi	8	1.082bcd	5.0bcde
LSD P=0.05	8.4		0.005	1.1
LSD P=0.01	11.2		0.007	1.5

##Samples assessed visually, scale 1-10, 6 =borderline, >6= too dark.

*Specific Gravity = Wt.Air/(Wt.Water-Wt.Water).

Note: Values for Line No's followed by the same letter are not significantly different ($P=0.05$) for Crisp Grade Yield and Specific Gravity and Crisp Colour.

The lines tested in this trial generally had high yield of crisping grade potatoes with number one ranked line 98-54-54 yielding 69.2 t/ha, although this was not significantly different to the check varieties Atlantic and Snowden it out-yielded the other check varieties. The specific gravity and crisp cook colour was not significantly different to Atlantic and all lines tested had acceptable cook colour other than Denali which was dark and rated 6.7. The other lines to show promising yield specific gravity and colour attributes were 99-78-6 and Snowden.

Discussion

French Fry

There were eight trials conducted at sites which included Ballarat, Toolangi, Berrigan, South Australian Loam and Sand, aimed at testing tuber shape and size suitability for French Fry processing, Fry Grade Yield, Specific Gravity and Fry Cook Colour at harvest. These were most commonly compared against the check varieties Russet Burbank, Shepody, Riverina Russet, Ranger Russet, McCain 1 and Stampede.

There were thirteen lines tested that performed better or equal to the check varieties in respect to fry grade yield that had suitable size and shape for French Fry Processing. The variability in performance of the lines across the range of environments and soil types indicates that while there is a degree of adaptation to specific sites, some lines appear to be robust by performing reasonable well in a range of conditions.

Line 92-37-1 performed well at Berrigan in both December and January harvests and has a degree of tomato spotted wilt virus resistance, good specific gravity and fry colour at harvest.

Line 97-100-1 was a line, which performed well at Berrigan in the January harvest, Ballarat North, Ballarat South and Toolangi, with good specific gravity and fry colour at all sites.

Line 99-4-9 yielded well at Ballarat North, South Australia on loam soil and at Toolangi but not significantly higher than the check varieties. It had acceptable specific gravity and fry cook colour.

Line 98-96-31 performed well for fry grade yield at Ballart North, Ballart South, Berrigan January harvest and on South Australian loam with very high specific gravity in two trials and acceptable fry colour at harvest although it did show some susceptibility to tomato spotted wilt virus at Berrigan.

Line 98-102-10 performed well at Ballarat North (Rank No1), South Australian sand and Toolangi with acceptable specific gravity and fry colour at harvest. Other lines, which performed well, were 99-48-2 (Rank No 5) South Australian sand and, 99-9-25 (Rank No 1) Toolangi.

All these lines need closer scrutiny by the French Fry sector to assess their commercial suitability.

Fresh

Four fresh trials were conducted in the South Australian Mallee with winter harvests in 2002 and 2003 and two trials at Toolangi for harvest in 2003. The check varieties used were Coliban, Luster, Nadine, Desiree, Ida Rose, Shine, Fontenot, Winter Gem, Ruby Lou and Sebago. Over the entire fifty tests of check varieties and numbered lines, thirty-three had suitable attributes for the fresh washed market.

A number of lines performed equally as well for number one grade yield as the best check varieties, however, crisp colour was generally darker than 6 and unacceptable for a number of check and numbered lines across all sites and harvests with exceptions for a few lines.

The outstanding fresh line for No 1 grade yield were 95-95-13 ranked one in the SA Mallee trial in 2002 and Toolangi A in 2003 and had significantly higher yield in both trials than the check varieties.

The other outstanding line for No 1 grade yield was 95-97-9, ranked 2 in the SA Mallee 2002 trial where it was significantly different to the check varieties and ranked 4 in the Toolangi A 2002 trial, although it was not significantly different to the check varieties in this trial.

Both lines, 95-95-13 and 95-97-9, had dark crisp cook colour in the tests from both sites.

The SA Mallee 2003 trial was drought affected and the adjoining crop was replanted but in spite of the tough condition some lines including the check variety Coliban still yielded in the range of 27 to 31 t/ha compared with Luster and Nadine around 7t/ha.

Crisp

Four crisp trials were conducted, Berrigan December harvest, Berrigan January Harvest, Koo Wee Rup and Toolangi using the check varieties Atlantic, Trent, Denali, Simcoe, ATX85404-8, Snowden and FL

1867. Across the four trials, in total thirty-one varieties and numbered lines show suitable tuber shape and size for processing into crisps.

A number of lines performed equally well in respect to crisp grade yield as Atlantic, 99-34-1, 99-34-12, 93-6-3, 99-35-14, 98-20-42, 99-78-6, 99-78-52, 98-54-54, 97-59-218 and 97-59-16 and all generally had very good crisp colour and specific gravity within the range of the check varieties and level of acceptability for commercial use.

The most out-standing line in respect to yield was 98-54-54 with a yield of 69.2 t/ha, although this was not significantly different to the check varieties Atlantic and Snowden it out-yielded the other check varieties.

General

The diversity in regional testing environments and harvest times across the sectors enhances the opportunity for industry to identify varieties suitable for specific market specifications and agronomic conditions.

The dry season in 2002/03 imposed additional selection pressure for lines capable of handling hot dry conditions where some check varieties and line performed exceptionally well when compared to others in the trials.

The other feature to emerge is that there is considerable variation within the lines in their expression of resistance to tomato spotted wilt virus with some lines showing resistance while others in the trial had 60% of tubers showing necrosis.

It was surprising how many of the fresh check varieties and numbered lines exceeded the borderline crisping cook colour of 6 at harvest across most sites and in this respect many lines were not significantly different to the check varieties.

Recommendations

A enhanced data management, analysis and interpretation system needs to be developed to streamline the processing of evaluating new lines against the check varieties. This system should support comparison across trials and years using check varieties as the benchmark.

The data needs to be available to industry to be used in addition to field observations and market knowledge for selecting new varieties for release and commercialisation.

The breeding and evaluation criteria for each sector need to be more clearly defined to help focus the breeding, screening and evaluation of new lines to enhance the chances of success by narrowing the focus of the program.

Consideration needs to be given to screening at G3 stage in environments other than Toolangi to increase the environmental pressure on genotypes and bring these conditions more in line with commercial production regions.

Berrigan December Harvest Crisp Trial 2002

Location: NSW, Berrigan, 35°54' S, 145°40' E

Planted: 08-08-02

Harvested: 17-12-02

Elevation: 150m

Soil Type: Sand

Spacing Between rows: 81 cm

Notes: 99-12-6 had very small plants.

Plants of 99-12-6, 99-34-12 and 99-72-1 had severe wind damage.

99-34-1 had fast germination and rapid growth.

99-34-12 had some tubers with common scab.

Varieties with the best shape for processing are marked bold.



Entry	Spacing in rows cm.	Yield. Tonnes Per Hectare					Rank by Crisp Grade	Tuber No. Per Plant	Quality	
		Chats	Small	Large	Crisp Grade	Over Size			Specific Gravity	Crisp* Colour
		<45mm	45-65mm	65-85mm	45-85mm	>85mm				
Atlantic	22.7	5.3	38.3	1.8	40.1	0.0	2	8.7	1.100	3.7
Trent	25.0	7.8	22.7	0.5	23.2	0.0	14	7.8	1.105	2.7
97-59-16	31.2	6.2	35.5	1.5	37.0	0.0	4	12.8	1.097	3.3
97-59-21	31.2	6.0	30.1	2.1	32.2	0.0	7	11.0	1.112	2.3
98-20-42	28.0	5.2	36.5	1.3	37.8	0.0	3	9.9	1.102	3.3
98-54-54	31.2	8.9	33.6	0.0	33.6	0.0	6	13.0	1.106	4.0
99-12-6	25.0	6.4	26.0	1.2	27.2	0.0	11	8.4	1.102	3.0
99-30-4	28.0	7.2	30.3	1.9	32.2	0.0	7	10.7	1.111	3.0
99-34-1	25.0	6.2	37.5	3.3	40.8	0.0	1	9.5	1.101	3.3
99-34-12	28.0	4.9	34.3	1.8	36.1	0.0	5	9.7	1.105	4.7
99-58-23	31.2	9.6	23.7	0.0	23.7	0.0	13	12.3	1.108	2.3
99-72-1	25.0	5.2	25.7	0.8	26.5	0.0	12	7.6	1.103	3.7
99-78-34	28.0	8.5	28.1	0.0	28.1	0.0	10	11.5	1.117	2.3
99-78-52	28.0	7.8	29.6	0.8	30.4	0.0	9	10.2	1.097	2.3
LSD P=0.05		2.4	6.9	2.3	6.2	0.0		2.3	0.006	1.5
LSD P=0.01		3.4	9.7	3.3	8.6	0.0		3.3	0.008	2.0

* Samples assessed visually , scale 1- 10, 6 = borderline, > 6 = too dark.

Specific Gravity = Wt.Air/(Wt.Air-Wt.Water)

Berrigan January Harvest Crisp Trial 2003

Location: NSW, Berrigan, 35°54' S, 145°40' E

Planted: 05-09-02

Harvested: 30-01-03

Elevation: 150m

Soil Type: Sand

Spacing Between rows: 81 cm

Notes: 93-6-3 and 97-84-6 had vigorous large plants.

99-78-9 had small plants

99-35-14 has light yellow tuber flesh

Tubers of 97-84-6 had heat shoots

93-6-3 and 97-84-6 were green plants at harvest.

Varieties with the best shaped tubers for processing are marked bold.



Entry	Spacing in rows cm.	Yield. Tonnes Per Hectare					Rank by Crisp Grade	Tuber No. Per Plant	Quality	
		Chats	Small	Large	Crisp Grade	Over Size			Specific Gravity	Crisp* Colour
		<45mm	45-65mm	65-85mm	45-85mm	>85mm				
Atlantic	22.7	2.7	30.9	16.5	47.5	0.9	2	7.6	1.085	3.0
93-6-3	28.0	4.5	37.4	16.7	54.1	0.3	1	11.1	1.093	5.3
96-47-5	31.2	3.8	23.5	3.7	27.2	0.0	6	8.4	1.083	7.0
97-84-6	28.0	7.2	44.4	2.7	47.1	0.0	4	14.6	1.087	5.7
99-14-10	28.0	8.3	33.9	2.0	35.9	0.0	5	12.4	1.096	5.7
99-35-14	25.0	8.6	43.0	4.6	47.6	0.0	3	13.0	1.087	2.3
99-78-9	31.2	7.8	19.9	0.3	20.2	0.0	7	11.0	1.091	5.0
LSD P=0.05		2.2	8.5	5.4	11.6	1.0		1.7	0.005	1.4
LSD P=0.01		3.1	11.9	7.6	16.3	1.5		2.4	0.007	1.9

* Samples assessed visually , scale 1- 10, 6 = borderline, > 6 = too dark.

Specific Gravity = Wt.Air/(Wt.Air-Wt.Water)

Koo Wee Rup Crisp Trial 2002/03

Location: Victoria, Koo Wee Rup, 38°09' S, 145°36' E

Planted: 18-12-02

Harvested: 28-05-03

Elevation: 10m

Soil Type: Peat

Spacing Between rows: 81 cm

Notes: The trial was planted late compared with the district average and into dry soil and as a result the trial had slow and uneven growth.

Hollow tubers were found at low frequency in 93-6-3 and 97-59-16 and high frequency in 99-14-10.

Varieties with best tuber shape and size for crop processing are marked in bold.



Soil Temperature at Harvest (10 cm) : 11°C

Entry	Spacing in rows cm.	Yield. Tonnes Per Hectare					Rank by Crisp Grade	Tuber No. Per Plant	Quality	
		Under >45mm	Small 45-65mm	Large 65-85mm	Crisp Grade 45-85mm	Over Size >85mm			Specific Gravity	Crisp * Colour
Atlantic	22.7	2.6	25.9	17.8	43.7	0.7	3	6.1	1.077	3.3
Denali	22.7	1.4	18.3	20.6	39.0	1.5	7	4.8	1.077	3.3
Simcoe	25.0	0.4	10.6	18.0	28.6	2.1	21	3.4	1.077	2.7
Trent	25.0	0.8	12.5	19.5	32.1	8.2	17	3.9	1.079	2.7
ATX 85404-8	25.0	3.0	22.5	17.5	40.0	1.1	5	6.8	1.073	2.7
93-6-3	28.0	2.2	23.9	23.6	47.5	0.7	1	7.8	1.071	2.7
96-47-5	28.0	3.1	18.5	12.2	30.7	0.3	19	6.6	1.073	6.7
97-24-1	35.7	4.7	27.7	5.2	32.8	0.0	16	10.8	1.084	3.7
97-59-16	35.7	3.8	20.1	16.3	36.4	0.0	11	9.7	1.078	2.7
97-84-6	28.0	3.6	24.0	9.9	33.9	0.2	14	7.4	1.073	2.7
98-12-24	33.4	3.4	20.6	16.3	36.9	0.9	9	8.8	1.077	2.7
98-20-42	33.4	2.3	21.3	23.8	45.2	0.6	2	8.8	1.075	3.0
99-12-6	25.0	4.3	21.8	11.3	33.0	0.0	15	7.3	1.076	2.3
99-14-10	28.0	4.4	23.2	7.6	30.9	0.0	18	7.7	1.088	3.0
99-30-4	28.0	4.7	15.6	6.9	22.5	0.2	24	6.8	1.079	2.7
99-34-1	25.0	2.8	15.4	11.8	27.2	0.2	23	5.3	1.076	2.7
99-34-2	28.0	4.2	23.0	6.7	29.8	0.0	20	7.6	1.076	2.0
99-34-12	28.0	2.9	20.1	16.5	36.6	1.0	10	7.1	1.075	4.7
99-35-14	25.0	2.6	25.8	14.8	40.6	0.0	4	7.2	1.080	2.7
99-51-4	28.0	5.6	27.0	9.4	36.4	0.0	11	9.5	1.081	4.0
99-78-6	28.0	5.4	26.5	12.6	39.2	0.4	6	9.7	1.079	2.7
99-78-9	28.0	5.4	26.8	7.4	34.2	0.0	13	9.4	1.087	2.7
99-78-34	28.0	2.8	20.7	7.8	28.4	0.0	22	6.2	1.073	3.7
99-78-52	28.0	6.2	29.9	7.1	37.0	0.0	8	10.1	1.081	2.3
LSD P=.05		1.5	8.0	8.5	6.2	**		1.5	0.003	1.6
LSD P=.01		2.0	10.7	11.3	8.3	**		2.1	0.004	2.2

* Samples assessed visually , scale 1- 10, 6 = borderline, > 6 = too dark

Specific Gravity = Wt.Air/(Wt.Air-Wt.Water)

** not enough data

CULTIVAR	SG %	Harv Cook	MONTHS STORED									
			2	COMMENT	4	COMMENT	6	COMMENT	8	COMMENT	10	COMMENT
	Date:	6-May		17-Jun								
Atlantic	1.081	4.7	5	Bruising								
Denali	1.091	6.7	6									
Simcoe	1.090	5.3	3									
Snowden	1.086	5.0	5									
Trent	1.086	5.0	6									
ATX 85404-8	1.074	4.3	5									
FL 1867	1.096	3.3	5									
93-6-3	1.088	6.0	5									
96-47-5	1.086	5.3	3									
97-24-1	1.095	5.7	5									
97-59-16	1.086	5.3	2									
97-59-21	1.082	4.0	2									
97-84-6	1.086	4.7	3									
98-12-24	1.087	5.3	2									
98-20-42	1.086	4.7	2									
98-54-54	1.075	6.0	6									
99-12-6	1.080	4.3	4									
99-14-10	1.105	4.7	5									
99-30-4	1.079	4.0	5	Bruising								
99-34-1	1.079	4.7	4									
99-34-2	1.081	4.3	7									
99-34-12	1.082	4.7	4									
99-35-14	1.084	4.7	5									
99-51-4	1.091	6.7	2									
99-58-23	1.082	4.3	5									
99-72-1	1.091	6.0	7									
99-78-6	1.082	4.7	2									
99-78-9	1.092	5.0	2									
99-78-34	1.078	6.7	7									
99-78-52	1.084	4.7	3									

Samples assessed visually, scale 1-10, 6 = borderline, >6 = too dark

SE= Stem End Discoloration, VR= Vascular Ring Discoloration, HH= Hollow Heart, DC= Dark Centre.

Toolangi Senior Crisp Trial 2002/03

Location: Victoria, Healesville, 37°32' S, 145°39' E

Planted: 19-11-02

Harvested: 17-04-03

Elevation: 550m

Soil Type: Clay loam

Spacing Between rows: 81 cm

Notes: Plants of Simcoe, 99-12-6 and 99-78-6 had uneven growth and 99-72-1 had many stunted plants.

Atlantic had some tubers with brown centre, 97-24-1 had some hollow tubers, 96-47-5 and 99-34-12 had many hollow tubers 93-6-3, 97-84-6 and 98-12-24 had long growing period. Varieties with best tuber size and shape for processing are marked in bold.



Entry	Spacing in rows cm.	Yield. Tonnes Per Hectare					Rank by Crisp Grade	Tuber No. Per Plant	Quality	
		Under <45mm	Small 45-65mm	Large 65-85mm	Crisp Grade 45-85mm	Over Size >85mm			Specific Gravity	Crisp * Colour
Atlantic	22.7	0.7	11.0	54.0	65.0	1.9	4	5.6	1.081	5.0
Denali	22.7	1.0	12.8	44.9	57.7	0.5	13	5.4	1.091	6.7
Simcoe	25.0	0.4	12.6	34.9	47.5	2.3	24	5.0	1.090	5.3
Snowden	25.0	1.4	18.3	49.2	67.5	0.9	2	7.7	1.086	5.0
Trent	25.0	0.8	10.5	41.9	52.3	1.9	19	5.3	1.086	5.0
ATX 85404-8	25.0	1.8	19.3	44.7	64.0	0.6	5	8.1	1.074	4.3
FL 1867	25.0	1.2	16.5	36.7	53.2	0.0	16	6.4	1.095	4.0
93-6-3	28.0	1.6	23.7	36.7	60.4	0.0	10	8.5	1.088	6.0
96-47-5	28.0	1.5	18.5	44.1	62.6	0.8	6	8.3	1.086	5.3
97-24-1	35.7	2.5	16.7	29.6	46.2	1.0	25	9.2	1.095	6.0
97-59-16	35.7	3.1	22.4	36.3	58.8	0.2	12	12.3	1.086	5.3
97-59-21	33.4	2.0	19.7	41.1	60.8	0.0	9	10.4	1.082	5.0
97-84-6	28.0	1.4	18.5	47.9	66.4	0.0	3	10.5	1.086	4.0
98-12-24	33.4	4.7	30.1	31.6	61.7	0.4	7	13.2	1.087	5.3
98-20-42	33.4	1.4	21.6	37.4	59.0	0.0	11	9.9	1.086	4.7
98-54-54	33.4	1.8	24.1	45.1	69.2	1.3	1	11.6	1.082	5.5
99-12-6	25.0	1.6	15.6	33.9	49.6	0.0	22	6.3	1.080	4.3
99-14-10	28.0	2.0	15.8	36.2	52.0	0.4	20	7.4	1.105	5.0
99-30-4	28.0	3.7	22.9	28.8	51.6	0.5	21	9.0	1.079	4.0
99-34-1	25.0	2.0	16.7	40.0	56.7	1.0	14	6.8	1.079	4.7
99-34-2	28.0	3.1	25.4	17.2	42.5	0.0	28	8.4	1.081	4.0
99-34-12	28.0	1.4	15.1	39.7	54.8	2.0	15	7.3	1.082	4.7
99-35-14	25.0	2.7	19.4	21.6	41.0	0.1	29	6.6	1.084	4.5
99-51-4	28.0	4.1	29.1	23.5	52.6	0.0	17	10.9	1.091	6.7
99-58-23	31.2	3.3	25.8	17.6	43.4	0.0	27	10.0	1.082	4.0
99-72-1	25.0	0.9	14.3	25.9	40.3	0.0	30	4.8	1.091	6.0
99-78-6	28.0	5.6	30.1	31.3	61.4	0.0	8	11.6	1.082	5.0
99-78-9	31.2	3.9	26.7	20.9	47.5	0.0	23	11.5	1.092	6.0
99-78-34	28.0	1.9	21.2	23.8	45.0	0.0	26	7.7	1.078	6.7
99-78-52	28.0	3.7	25.8	26.8	52.5	0.0	18	9.9	1.084	4.7
LSD P=0.05		1.3	6.2	7.6	8.4	**	1.8		0.005	1.1
LSD P=0.01		1.7	8.2	10.2	11.2	**	2.4		0.007	1.5

* Samples assessed visually , scale 1- 10, 6 = borderline, > 6 = too dark

Specific Gravity = Wt.Air/(Wt.Air-Wt.Water)

** not enough data

Senior French Fry B 02/03 9° Storage

Entries	SG	Harvest (9th May)							2 Months Storage (9th July)						
		0	1	2	3	4	Ends	Comment	0	1	2	3	4	Ends	Comment
Russet Burbank	1.082	97%	3%				3%		100%						
99-4-9	1.081	100%							100%						
99-4-12	1.086	100%							100%						
99-9-13	1.083	100%							100%						
99-9-25	1.079	93%	7%						100%						
99-33-46	1.091	100%							100%						
99-33-65	1.089	100%							100%						
99-48-2	1.076	100%							100%						
99-48-10	1.079	93%	7%				3%		100%						
99-49-13	1.086	100%							80%	20%					
99-67-1	1.091	100%						3%HH	100%						
99-67-7	1.080	100%							100%						
99-67-18	1.085	100%							100%						
99-70-16	1.082	100%							100%						
99-70-19	1.083	100%							100%						
99-71-6	1.084	100%							100%						

Toolangi Senior Fresh B 2002/03

Location: Victoria, Healesville, 37°32' S, 145°39' E.

Planted: 04-12-02

Harvested: 30-04-03

Elevation: 550m.

Soil Type: Clay loam.

Spacing Between rows: 81 cm.

Notes: Plants of 99-32-18 had very slow germination and very slow early growth.

99-66-9 had some hollow tubers. 99-52-2 and 99-66-15 had light yellow tuber flesh.

99-27-20 had good appearance for brushing only (skin texture)

Varieties with best looking tubers for washed sale are marked in bold.



Entry	Spacing in rows cm	Yield, Tonnes per Hectare						Rank by No.1 Grade	Tuber No. Per Plant	Quality	
		Chats	Small	Medium	Large	No.1 Grade	Over Size			Specific Gravity	Crisp * Colour
		0-70g	70-120g	120-350g	350-450g	70-450g	>450g				
Coliban	25.0	2.3	4.7	27.1	25.3	57.1	9.5	14	6.5	1.068	7.0
Desiree (red)	25.0	6.6	16.6	35.6	8.7	60.9	3.2	6	11.3	1.082	6.0
Pontiac (red)	25.0	2.4	6.0	30.9	22.6	59.4	1.3	7	7.1	1.064	9.0
Ruby Lou (red)	25.0	5.2	10.1	32.9	13.3	56.3	3.1	16	8.0	1.081	3.3
Sebago	25.0	3.5	8.7	32.3	17.2	58.2	3.4	10	7.7	1.071	4.7
99-10-1	25.0	6.1	17.6	20.0	0.9	38.4	0.0	27	8.5	1.062	4.3
99-10-8	25.0	3.6	9.3	39.1	12.5	61.0	0.0	5	8.8	1.065	4.0
99-17-2	25.0	5.0	11.4	38.1	7.8	57.3	0.4	12	9.2	1.073	7.7
99-20-3	25.0	6.4	17.5	36.1	4.2	57.8	0.0	11	10.6	1.066	9.0
99-20-8	25.0	6.5	15.6	24.0	1.1	40.7	0.8	26	9.3	1.078	4.0
99-20-11	25.0	1.8	7.3	37.6	14.2	59.1	0.2	8	7.1	1.061	8.3
99-27-7	25.0	3.1	8.6	30.1	10.8	49.5	0.0	20	7.2	1.077	6.0
99-27-20	25.0	2.8	6.8	32.4	17.6	56.9	3.5	15	7.2	1.073	3.0
99-29-11 (red)	25.0	2.2	4.6	26.5	13.4	44.5	0.3	24	5.6	1.067	7.7
99-31-2	25.0	8.5	19.6	37.0	13.4	70.1	1.1	1	13.0	1.066	6.3
99-31-3	25.0	5.1	7.9	29.0	9.7	46.6	0.0	21	7.5	1.058	7.0
99-32-13	25.0	9.8	17.7	26.8	2.1	46.5	0.0	22	11.6	1.064	5.7
99-32-18	25.0	1.8	3.6	20.7	28.3	52.6	6.2	18	5.6	1.067	6.3
99-36-1	25.0	5.4	14.2	28.9	1.5	44.6	0.0	23	8.8	1.068	3.7
99-36-8	25.0	3.8	12.5	41.3	8.2	62.0	0.5	3	9.2	1.065	7.0
99-52-1 (red)	25.0	3.3	8.3	33.8	20.1	62.2	4.3	2	7.8	1.072	5.3
99-52-2 (red)	25.0	4.4	14.5	33.7	7.8	56.0	0.9	17	9.1	1.074	5.3
99-66-9	25.0	4.0	11.4	37.6	9.7	58.8	0.0	9	8.6	1.085	4.0
99-66-15	25.0	6.1	13.4	28.6	2.3	44.3	0.0	25	8.8	1.079	5.7
99-69-1	25.0	6.0	17.7	33.5	6.1	57.3	0.0	13	10.1	1.071	7.0
99-74-27	25.0	3.7	5.3	29.4	15.7	50.5	3.6	19	6.7	1.059	6.7
99-79-1	25.0	3.3	8.2	38.1	15.5	61.8	0.9	4	8.2	1.071	6.7
LSD P=0.05		1.8	3.9	7.9	5.1	9.1	**		1.9	0.004	2.7
LSD P=0.01		2.4	5.2	10.6	6.8	12.2	**		1.5	0.006	2.0

* Samples assessed visually, scale 1 - 10, 6 = borderline, > 6 = too dark

Specific Gravity = Wt.Air/(Wt.Air-Wt.Water)

** not enough data