



Know-how for Horticulture™

Potato evaluation trials - Simplot

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Tasmanian Institute of Agric
Research

Project Number: PT04018

PT04018

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Potato Evaluation Trials - Simplot

**Final Report of Project Number PT04018
to Horticulture Australia Limited**

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This report describes the work carried out by the project team for 2004-2005 on behalf of Simplot Australia. This work continues the evaluation of selected processing potato cultivars and lines in Tasmania for the production of French fries. This work was previously carried out by the Tasmanian Institute of Agricultural Research on behalf of Simplot Australia and potato growers with matching contribution from HAL (PT03029). A final report of such project work was accepted by HAL in October 2004. With the continuing need for improved yield and quality for French fries, Simplot Australia requested further comparison of new genetic material with commercial standard cultivars in the season 2004-05, with support of matched voluntary contribution from HAL.

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4. Lyndon Butler, Tasmanian Department of Primary Industries, Water and Environment, who has helped with field operations.
5. Dr Tony Slater, IHD

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Media Summary

Evaluation of the commercial processing potential (for French fry production) of new potato genotypes has been ongoing in Tasmania for several years. This work was previously carried out by the Tasmanian Institute of Agricultural Research on behalf of processing companies and potato growers with contribution from HAL potato levy funds. A final report of such project work between 1996-2003 (PT 96005) was accepted by HAL in September 2003. Changes to the funding arrangements for this work left some early generation selections in need of further evaluation and Simplot Australia requested further comparison of these lines with commercial standard cultivars in the season 2003-04, with support of matched voluntary contribution to HAL. A final report of such project work (PT 03029) was accepted by HAL in October 2004. With the continuing need for improved yield and quality for French fries, Simplot Australia requested further comparison of new genetic material with commercial standard cultivars in the season 2004-05, with support of matched voluntary contribution from HAL.

Fourteen new potato varieties and three standard commercial cultivars were planted at Forthside Research Station in North-West Tasmania in November 2004. The trial, managed according to local commercial practice, was allowed to senesce naturally and was harvested in April 2005. From data collected for yield and quality parameters, six of the new genotypes displayed enough potential to warrant further investigation.

This report provides the results for 2004-05 obtained by the project team on behalf of Simplot Australia.

Technical Summary

Fourteen new potato genotypes from the Australian Processing Potato Improvement Program (APPIP) at Toolangi and three standard commercial cultivars were planted at the Forthside Research Station (FRS) in North-West Tasmania on 17 November 2004. The trial design was a randomised block containing three replicates with an individual plot size of 8.2m² (2 rows x 5 metres).

The trial was sited on a red ferrosol soil, and was managed according to current commercial husbandry practices for the industry standard cultivar Russet Burbank. The trial was managed by TIAR and was funded by a voluntary contribution arrangement between Simplot and HAL. The trial was allowed to senesce naturally and was harvested on 27 April 2005. TIAR staff maintained records for the trial throughout growth and during harvest assessment. Tuber yield, its components and quality parameters indicative of the lines' French fry processing suitabilities were recorded. Harvest notes and ratings were made by Mark Heap, Sharon Saunders and Scott Morris (Simplot Australia).

Twelve genotypes were significantly better yielding than the industry standard Russet Burbank for processing yield. Specific gravity was very high across all entries, with 1.101 for Russet Burbank and 1.088 for Shepody. Common and Powdery scab levels were generally low throughout the trial site, with differences in tolerance being noted both at harvest and processing.

There were six new genotypes that showed some promise in the trial. From a field perspective, they scored well against the industry standards. In a scoring system which rated cultivars according to Simplot's requirements, Russet Burbank rated 5.5/10 and Ranger Russet rated 6.0/10. All of the six new genotypes scored over 6.0.

It is intended to take these six new genotypes on to a detailed comparison in 2005-06. The best reselections will then proceed to agronomy profiling work starting in 2006-07. If any of the new genotypes tested in 2004-05 prove to be commercially viable, growers can expect to see commercial use in 2007-08.

A new set of APPIP lines will be tested at FVRS in 2005-06.

Introduction

Potato genetic improvement through the breeding and evaluation of potato genotypes and cultivars has been seen to be an important part of Australia's potato research portfolio. The Tasmanian industry has benefited from the introduction and testing of genotypes such as Nooksack and Ranger Russet by APPIP. In more recent seasons, the breeding program's increased focus on processing potato genotypes has led to a greater proportion of Australian-bred material flowing through to commercial development. The time-lines associated with the latter, however, dictate that these genotypes have yet to enter commercial use.

Evaluation of new potato genotypes for French fry production in Tasmania was previously carried out by the Tasmanian Institute of Agricultural Research on behalf of processing companies and potato growers with contribution from HAL potato levy funds. A final report of such project work between 1996-2003 (PT 96005) was accepted by HAL in September 2003. Changes to the funding arrangements for this work left some early generation selections in need of further evaluation and Simplot Australia requested further comparison of these lines with commercial standard cultivars in the season 2003-04, with support of matched voluntary contribution to HAL. A final report of such project work (PT 03029) was accepted by HAL in October 2004. With the continuing need for improved yield and quality for French fries, Simplot Australia requested further comparison of new genetic material with commercial standard cultivars in the season 2004-05, with support of matched voluntary contribution from HAL.

This report provides the results obtained by the project team for 2004-05 on behalf of Simplot Australia.

Industry involvement and research collaboration

Throughout the 2004-05 season, personnel representing J.R. Simplot Australia have observed the performance of the introduced lines and have been instrumental in making selections for ongoing evaluation.

The work also has involved collaboration with Dr Tony Slater, coordinator of the APPIP Toolangi national program, who provided the new genotypes for evaluation.

General Methodology

After initial in-situ selection by Mark Heap of Simplot Australia, approximately 10kg of seed tubers of each of fourteen lines were received from the APPIP Toolangi breeding program and planted, on 17 November 2004, in one field comparison at FRS, near Devonport in North-West Tasmania. The current commercial standards, Russet Burbank, Shepody and Ranger Russet (sourced from Toolangi in order to have the same generational attributes as the new genotypes) were used as controls for this evaluation.

The trial was replicated three times and plot size was 8.2m² (two rows, each five metres long). Plots were buffered and separated in-row by commercial, distinctively coloured tuber cultivars and current commercial husbandry practices were used. Tuber yield and quality parameters indicative of lines' French fry processing suitabilities were recorded and analysed.

After commercial standard practices of land preparation, the trial was planted by hand into open furrows formed by a Faun potato planter, with which 11:13:19 fertiliser was band placed at a rate of 1713 kg/ha. The commercial standard cultivars, Russet Burbank, Ranger Russet and Shepody were planted at sett spacings of 325mm, 250mm and 200mm respectively. Sett spacings for new genotypes ranged from 250mm to 325mm. The seed tubers were covered in the row and plants were hilled at approximately 25 per cent row cover. Weeds were controlled with a pre-emergent application of Sprayseed® at a rate of 2 L/ha and by mechanical means, as required, after emergence. Fungicides were applied as per usual local commercial practice with a spray program utilising Bravo500® (at a rate of 1.5 L/ha), Score® (at a rate of 0.3 L/ha) and Penncozeb750DF® (at a rate of 2.2 kg/ha) as required. Rows were spaced at 810mm intervals.

The trial, grown through to maturity, was allowed to senesce naturally and was harvested on 27 April 2005. Selections were made from this trial through joint observation and discussion between Simplot R&D manager Mr Mark Heap, Simplot field officers and TIAR staff.

Tuber yield parameters :

Samples were graded by tuber weight into the following components;

0 to 80 grams

80 to 250 grams

250 to 650 grams

650 to 850 grams

>850 grams

Mishapen/distorted tubers

Cracked tubers

Diseased tubers

Combinations of the above components provided total, ware and waste grade yields.

Plant counts at emergence provided tuber numbers per plant, a commercially accepted measure of yield potential.

Tuber quality parameters :

Internal Defects protocol

For each sample, ten tubers were cut from the largest size grade available to assess internal defects, principally hollow heart. If any tubers were detected with defects then another ten tubers from the next lower size grade were cut and results recorded.

Bruising protocol

Tube length = 60cm

Ball bearing weight = 130gms

Ball bearing diameter = 3cm

Five tubers were randomly selected from the 80 to 650 gram tuber weight range. Four target spots were marked (with liquid paper) on each tuber (two at rose end and two at stem end). With the tuber firmly placed under tube to absorb full impact, the ball bearing was dropped once on each target spot. Samples were stored at 20C for twenty-four hours then target spots were peeled and bruise severity recorded as per score sheet (ratings 0=nil to 9=severe). In addition to this, an overall score of tuber shattering severity was recorded for each sample.

Dry matter

This was estimated using specific gravity (weight in water, weight in air method). A sample of approximately 2kg of tubers was tested from each plot. Specific gravity results were then converted to dry matter percentage as per the Toolangi method.

Fry colour protocol

This test was based on the methods used by the intake laboratory at the Ulverstone factory of Simplot Australia. One 10mm section French fry was cut from the centre of ten tubers for each plot. These strips were washed and dried before cooking. Fries were cooked for 150 seconds at a temperature of 190 C in Cottonseed oil. To maintain an acceptable commercial standard, the oil was changed after every fifty samples. Overall colour of each fry was scored as per the USDA 1988 French fry colour chart, a scale of 000, 00, 0, 1, 2, 3 and 4 with 000 being white and 4 being dark gold. A score of 0 or less was acceptable. These individual fry ratings were then represented as a percentage of the entire sample. The percentage of “dark ends” (sugar accumulation and subsequent caramelisation after cooking) was noted for each sample. In addition to the above, uncooked flesh colour was recorded at processing.

Results

Table 1 contains the data collected for yield and quality parameters for the 14 new genotypes and for the **Russet Burbank**, **Ranger Russet** and **Shepody** check plots. Table 2 contains the observations made throughout the growing season, at harvest and at processing for general plant and tuber appearance. Table 3 contains boiling test data. The line **FRS7** returned the highest total and fry-grade yields but exhibited unacceptable flesh and fry colour.

For processing yield, the genotypes **FRS2**, **FRS3**, **FRS4**, **FRS5**, **FRS6**, **FRS7**, **FRS8**, **FRS9**, **FRS10**, **FRS11**, **FRS12** and **FRS13** had significantly higher yields than **Russet Burbank** ($P < 0.05$).

Specific gravity was high for all lines evaluated, (grand mean of 1.099 for the trial) however only one genotype (**FRS1**) was significantly greater than **Russet Burbank** ($P < 0.05$). It should be noted that none of the cultivars or genotypes tested had specific gravity readings below the minimum industry acceptance level of 1.070.

Common and powdery scab incidence was minimal throughout the trial site, with differences in tolerance being noted both at harvest and processing (see Table 2). Four genotypes (**FRS1**, **FRS2**, **FRS8**, and **FRS9**) were observed with low levels of Powdery scab infestation whilst **FRS10** and **FRS11** had moderate levels of the disease. **FRS5** was the only genotype to be observed with low levels of Common scab.

Of the twelve genotypes (as listed above) which performed significantly better than **Russet Burbank** for processing yield, five (**FRS2**, **FRS3**, **FRS6**, **FRS12** and **FRS13**) had a similar maturity period to that of **Russet Burbank**, whilst **FRS5** and **FRS11** were significantly earlier, and the remainder were significantly later in maturity ($P < 0.05$).

In addition to overall fry colour, colour consistency is a major factor in determining commercial suitability of new potato genotypes. Of the twelve genotypes (as listed above) which performed significantly better than **Russet Burbank** for processing yield, **FRS2**, **FRS6**, **FRS7**, **FRS8**, **FRS12** and **FRS13** had a darker fry colour overall than **Russet Burbank**. Two of these six genotypes (**FRS12** and **FRS13**) displayed a degree of colour variation within their respective samples. Although **FRS3**, **FRS5**, **FRS8**, **FRS12** and **FRS14** had notable proportions of “dark ends” (after cook darkening caused by sugar accumulation at the ends of tubers), they were not significantly different to those of **Russet Burbank** ($P < 0.05$).

FRS1 had similar levels of total internal defects to that of **Russet Burbank**, **FRS8** and **FRS10** had significantly higher levels than **Russet Burbank**, whilst the remaining genotypes had significantly lower levels of total internal defects than the industry standard ($P < 0.05$).

Discussion

Six lines were selected by Simplot representatives and researchers as being worthy of further evaluation in future work. These cultivars will be subject to detailed agronomic investigation over the next two seasons by TIAR and Simplot Australia. If any of the new genotypes tested in 2004-05 prove to be commercially viable, growers can expect to see commercial production in 2007-08.

Arrangements with Simplot Australia for the further evaluation of these six genotypes are the subject of discussions at the time of writing this report.

Technology transfer

The season's work was presented at an Open Day at FRS in December 2004. Results again were reported to an industry forum organized by the Potato Research and Advisory Committee in Tasmania in July 2004.

Conclusions

The comparative evaluation of new potato genotypes reported here continues to be a major part of the ongoing development of the Tasmanian potato industry and, beyond that, a contribution to the Australian Processing Potato Improvement Program. The latter is a significant part of Horticulture Australia Limited's research and development portfolio for the potato industry.

Approximately forty percent of all lines evaluated in this trial were retained for their superior attributes in relation to the industry standard Russet Burbank. Simplot Australia consider this a positive outcome for the project and believe the continuation of this work is justified.

References

- | | |
|---------------|--|
| Laurence RCN. | Potato cultivar accession and testing in Tasmania
Final report of project PT96005 to Horticulture
Australia Limited. September 2003. |
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Australia Limited. October 2004. |

Table 1.

Cultivar	Spacing in rows cm	Yield and Numbers														Rank by Fry Grade	Tuber No. Per Plant	Days to Maturity	
		Chats 0-80g		Small 80-250g		Mid 250-650g		Large 650-850g		Over >850g		Frygrade >80g t/ha	Total Yield t/ha	80 - 650g Yield t/ha	% of Fry Grade Wt. >250g				Waste Yield t/ha
		No./m2	t/ha	No./m2	t/ha	No./m2	t/ha	No./m2	t/ha	No./m2	t/ha								
FRS1	27.5	5.9	2.5	16.6	26.2	6.3	21.9	0.2	1.3	0.0	0.0	49.4	52.3	48.1	47.6	0.4	16	6.7	156.0
FRS2	32.5	7.0	3.1	26.9	42.2	8.7	28.6	0.1	0.7	0.0	0.0	71.5	76.1	70.8	40.8	1.5	5	11.3	148.0
FRS3	27.5	4.0	2.0	19.2	31.7	8.0	27.1	0.0	0.0	0.0	0.0	58.8	64.8	58.8	46.1	4.0	13	7.5	147.3
FRS4	32.5	9.1	3.5	30.7	48.7	8.7	28.8	0.1	0.6	0.0	0.0	78.2	83.3	77.6	38.5	1.6	2	12.9	157.0
FRS5	30	5.5	2.4	19.0	30.8	9.6	33.3	0.1	0.3	0.0	0.0	64.4	68.7	64.1	52.2	2.0	11	8.5	143.0
FRS6	30	5.6	2.6	28.3	43.3	4.3	13.0	0.0	0.0	0.0	0.0	56.3	61.9	56.3	23.1	3.0	14	9.9	148.0
FRS7	30	7.8	3.4	23.6	39.8	12.1	41.8	0.1	1.3	0.0	0.0	82.9	88.0	81.6	51.8	1.8	1	10.7	153.0
FRS8	30	5.6	2.3	21.3	29.7	11.6	39.6	0.1	0.8	0.1	0.4	70.4	73.3	69.3	57.7	0.5	6	9.4	156.0
FRS9	30	6.6	2.8	27.8	39.8	8.6	27.9	0.1	0.7	0.0	0.0	68.3	71.7	67.7	40.6	0.5	7	10.6	151.7
FRS10	25	3.4	1.4	12.0	20.1	12.2	47.2	0.5	3.5	0.1	1.3	72.2	77.8	67.4	72.3	4.3	4	6.0	151.7
FRS11	27.5	6.3	2.9	30.5	49.9	7.7	25.4	0.0	0.0	0.0	0.0	75.3	80.1	75.3	34.4	1.8	3	10.3	143.0
FRS12	30	3.7	1.6	18.2	30.3	9.7	33.5	0.2	1.7	0.0	0.0	65.5	72.8	63.8	53.7	5.7	9	8.1	146.3
FRS13	32.5	7.7	3.8	29.5	44.3	5.8	19.1	0.0	0.0	0.0	0.0	63.4	68.9	63.4	30.0	1.7	12	11.5	148.0
FRS14	27.5	3.1	1.3	18.1	31.6	6.6	21.4	0.0	0.0	0.0	0.0	52.9	61.0	52.9	40.4	6.7	15	6.8	157.0
Ranger Russet RB	25	3.8	1.6	19.3	32.0	8.7	30.6	0.3	2.0	0.0	0.0	64.6	69.2	62.6	50.5	3.0	10	6.8	148.0
Shepody	32.5	4.4	2.0	15.2	25.1	5.4	19.0	0.1	0.3	0.0	0.0	44.5	69.9	44.2	42.4	23.5	17	8.3	148.0
Shepody	20	3.9	1.8	16.6	27.5	10.7	37.2	0.3	2.0	0.0	0.0	66.7	71.2	64.7	58.7	2.7	8	5.4	131.7
LSD P = 0.05		2.1	1.0	7.1	10.3	2.9	10.2	0.3	ns	0.1	0.6	10.9	10.3	11.6	12.2	3.1		1.7	2.8
LSD P = 0.01		2.9	1.3	9.6	13.8	3.9	13.8	ns	ns	ns	ns	14.7	13.8	15.6	16.4	4.2		2.2	3.8

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

Table 1. cont

Cultivar	Quality													Internal Defects (percentage of sample)						
	Bruise Ratings			Specific Gravity	% Dry Matter	Fry Assessment								Uncooked Flesh Colour	1st 10	1st 10	1st 10	2nd 10	2nd 10	2nd 10
	Stem end	Rose end	Shatter			%000	%00	%0	%1	%2	%3	%4	Dark End %		Hollow	Brown Centre	Total	Hollow	Brown Centre	Total
FRS1	6.6	5.9	1.7	1.113	27.0	0.0	0.0	6.7	73.3	23.3	0.0	0.0	3.3	1.0	37	3	40	0	0	0
FRS2	6.7	6.5	3.0	1.096	23.5	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	3.3	0	0	0	0	0	0
FRS3	5.9	4.5	1.0	1.096	23.4	0.0	63.3	36.7	0.0	0.0	0.0	0.0	20.0	1.0	0	0	0	0	0	0
FRS4	5.9	3.3	0.3	1.101	24.4	0.0	43.3	56.7	0.0	0.0	0.0	0.0	0.0	1.3	3	0	3	0	0	0
FRS5	5.8	4.4	1.0	1.102	24.6	0.0	50.0	50.0	0.0	0.0	0.0	0.0	10.0	1.0	7	0	7	0	0	0
FRS6	7.1	7.1	3.0	1.096	23.4	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	4.0	0	0	0	0	0	0
FRS7	5.8	4.9	1.0	1.100	24.3	0.0	0.0	66.7	33.3	0.0	0.0	0.0	3.3	3.3	0	0	0	0	0	0
FRS8	5.4	4.1	0.5	1.104	25.1	0.0	0.0	50.0	50.0	0.0	0.0	0.0	23.3	5.0	57	3	60	7	0	7
FRS9	4.5	4.4	0.5	1.089	21.9	0.0	66.7	33.3	0.0	0.0	0.0	0.0	0.0	1.7	0	0	0	0	0	0
FRS10	5.1	4.0	1.7	1.097	23.7	0.0	60.0	40.0	0.0	0.0	0.0	0.0	10.0	1.3	50	0	50	3	0	3
FRS11	4.2	2.8	0.8	1.097	23.6	0.0	86.7	13.3	0.0	0.0	0.0	0.0	0.0	1.3	7	0	7	0	0	0
FRS12	4.0	1.4	0.0	1.099	24.1	0.0	0.0	46.7	46.7	6.7	0.0	0.0	20.0	1.0	0	0	0	0	0	0
FRS13	5.0	2.8	0.0	1.104	25.0	0.0	6.7	90.0	3.3	0.0	0.0	0.0	0.0	1.3	0	3	3	0	0	0
FRS14	5.0	5.3	1.5	1.097	23.6	0.0	70.0	30.0	0.0	0.0	0.0	0.0	23.3	1.0	0	0	0	0	0	0
Ranger	6.2	5.1	0.3	1.101	24.4	0.0	0.0	70.0	30.0	0.0	0.0	0.0	23.3	1.0	0	0	0	0	0	0
Russet																				
RB	5.3	4.7	0.8	1.101	24.5	0.0	73.3	26.7	0.0	0.0	0.0	0.0	6.7	1.0	27	10	37	20	30	50
Shepody	3.6	4.1	1.0	1.088	21.8	0.0	0.0	63.3	33.3	3.3	0.0	0.0	26.7	1.0	0	0	0	0	0	0
LSD P=0.05	1.1	1.5	0.8	0.007	1.4	na	34.4	42.5	24.7	7.2	na	na	18.3	0.8	22	ns	22	5	4	3
LSD P=0.01	1.5	2.0	1.1	0.009	1.8	na	46.3	57.1	33.2	9.7	na	na	24.5	1.0	30	ns	30	7	5	4

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

Uncooked Flesh Colour :
1 = white
2 = Creamy White (Off White)
3 = Cream
4 = Dark Cream
5 = Bright Yellow (Yellow)

Table 2.

Cultivar	Skin Colour	Skin Texture	Primary Shape & approx percentage of sample	Secondary Shapes	Eye Depth	Heel Depth	Distortion	Size	Size Uniformity	Harvest Comments
										27/4/2005
FRS1	c	ru	ob 60	ta, p, tw	sh	sh	vsl	m / l	v un	few tubers?, stolons, hollow
FRS2	c	sl ru	ob 50	ta, vsl tw, p	sh	sh	vsl	s / m	sl un	variable shape, too small, flesh colour?, tuber no.
FRS3	c	sm / sl ru	ob 50	r, p, bl, tw	sh	sh	vsl / sl	m	sl un	greens, stolons, variable shape
FRS4	br	ru	ob 80	p, ta, bl	sh	sh	sl	m	sl un	shape OK, lot of tubers, smallish?
FRS5	c	ru	ob 80	bl, p	sh	sh	vsl	m / l	un	good shape, size variation?, odd stolon & green
FRS6	d c	sm	ob 60	ta, p, tw	sh	sh	nil	s / m	ev	variable shape, too small, flesh colour???
FRS7	c	sl ru	ob 50	p, r, ta, tw	m	sh	nil	m / l	sl un	variable shape, flesh colour???
FRS8	d c	ru	ob 60	p, ta	m	sh	nil	m / l	un	shape OK but size variation!, hollow, flesh colour?
FRS9	c	sl ru	ta 50	p, ob, r	sh	sh	vsl	m / l	un	poor shape, odd green
FRS10	c	sl ru	l ob 70	bl, p, tw, r	sh	sh	sl	l	sl un	poor shape, greens, scab, hollow, brown fleck
FRS11	c	sl ru	ob 60	r, p, bl, tw	sh	sh	nil	s / m	sl un	too small?, scab, shape variation
FRS12	br	ru	l ob 60	p, tw, ta	m	sh	sl	l	un	slight cracking, long thin tubers
FRS13	c	sl ru	ob 70	p, ta, r	sh	sh	vsl	m	sl un	odd green, thin tubers?, odd stolon
FRS14	br	h ru	ob 80	p, r, bl	m	sh	vsl	m / l	sl un	cracking, slightly variable shape
Ranger Russet	br	h ru	ob 50	tw, r, p, bl	m	sh	d	m / l	un	variable shape, some cracking, thinnish tubers
RB	br	h ru	ob 50	bl, p, r	m	sh	v d	m / l	un	severe cracking, hollow, variable shape & size
Shepody	c	sm	p 60	ob, ta, r, tw	sh	sh	vsl	l	sl un	odd green, variable shape, slight scab

Key : As for G3 Toolangi French fry trials

Skin Colour :	br = brown c = cream d = dark	Eye & Heel Depth :	m = moderate sh = shallow
Skin Texture :	h = heavy ru = russet sl = slight sm = smooth	Distortion :	d = distorted sl = slight v = very vsl = very slight
Primary & Secondary Shapes :	bl = block l = long ob = oblong p = pear r = round ta = taper tw = twist vsl = very slight	Size :	s = small m = medium l = large
		Size Uniformity :	ev = even un = uneven sl = slight v = very

Table 2. cont

Cultivar	Observations at grading (9/5/2005)			Observations at processing 19/5/2005	Flower Colour
	Comment	Common Scab	Powdery Scab		
		0 - 3	0 - 3		
FRS1	long oblong, pear, taper	0.0	0.2	mottling	mauve
FRS2	long oblong, pear, taper, odd banana, large are lumpy, too thin?	0.0	0.3	slight yellow fry, severe shatter	white
FRS3	oblong, odd pear, large are lumpy	0.0	0.0		mauve
FRS4	oblong, pear, odd taper, large are lumpy	0.0	0.0		purple
FRS5	long oblong, odd pear, vs1 taper, large are lumpy	0.2	0.0		mauve
FRS6	thin tapers, pears & oblongs (too thin?), impact damage & resultant breakdown	0.0	0.0	yellow fry, severe shatter	mauve
FRS7	oblong, odd pear, odd taper, fairly good shape	0.0	0.0	slight yellow fry	mauve
FRS8	long oblong, odd pear, odd taper, large are lumpy	0.0	0.2	yellow fry	mauve
FRS9	oblong, pear & tapers, too flat?	0.0	0.2	very slight vascular ring	white
FRS10	long oblong, tapers, odd pear, large are lumpy, brown fleck, breakdown	0.0	1.5	brown fleck	white
FRS11	oblong, pear, odd banana & odd taper	0.0	1.0		white
FRS12	long oblong, bananas, odd pear & odd taper, too thin?	0.0	0.0	slight mottling	mauve
FRS13	long oblong, taper, pear, too thin?	0.0	0.0	very slight vascular ring	mauve
FRS14	oblong, odd pear, good shape, impact damage	0.0	0.0		mauve
Ranger Russet	long oblong, oblong, odd pear, banana & taper, distorts	0.0	0.0	slight mottling, very slight vascular ring	mauve
RB	oblong, pear, odd banana, large are lumpy, lot of distorts	0.0	0.0	vascular ring	white
Shepody	pear, taper, oblong, large are lumpy, too flat?	0.0	0.8		mauve

Key : Common & Powdery Scab :
 0 = nil infestation
 1 = slight infestation
 2 = moderate infestation
 3 = severe infestaion

Table 3.

Cultivar	Cooked Flesh Colour	After Cook Darkening (10 mins)	After Cook Darkening (24 hrs)	Disintegration / Sloughing	Softness
FRS1	3	1	2	3	2
FRS2	3	2	2	3	3
FRS3	1	2	3	2	3
FRS4	2	1	2	2	3
FRS5	2	1	2	5	5
FRS6	5	1	2	1	3
FRS7	5	1	1	3	2
FRS8	4	1	2	2	2
FRS9	2	1	2	1	1
FRS10	2	2	5	4	2
FRS11	1	1	1	2	2
FRS12	1	1	1	3	4
FRS13	1	1	1 excellent	5	2
FRS14	2	4	4 & 5	3	3
Ranger Russet	1	2	3	2	2
RB	1	4	4 & 5	3	3
Shepody	1	1	1	2	1

Key : **Cooked Flesh Colour :**

- 1 = White
- 2 = Creamy White (Off White)
- 3 = Cream
- 4 = Deep Cream
- 5 = Bright Yellow (Yellow)

After Cook Darkening :

- 1 = Nil
- 2 = Slight (lightly grey)
- 3 = Moderate (greyish black)
- 4 = Marked (blackening around eyes and/or stem end)
- 5 = Severe (general blackening)

Softness

- 1 = Firm (does not readily break up when tested with fork)
- 2 = Fairly Firm (can be broken into large lumps which retain a strong mutual cohesion)
- 3 = Fairly Soft (can be broken apart easily)
- 4 = Soft (breaks easily up into mass of glistening crumbs with little cohesion)
- 5 = Very Soft (breaks up easily and mashes into a slurry)

**Disintegration
and
Sloughing**

- 1 = Nil (surface smooth and translucent)
- 2 = Slight (surface dull but mainly intact)
- 3 = Moderate (major part of surface sloughed off but mainly intact)
- 4 = Severe (floury mass)
- 5 = Very Severe (soupy)