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# **Evaluation of internationally bred potatoes**

Michael Hughes  
QLD Department of  
Primary Industries

Project Number: PT01044

## **PT01044**

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**Horticulture Australia Project PT01044  
(completion date 30 May 2003)**

# **Evaluation of Internationally Bred Potatoes**

**Final Report**  
(Public)

**Compiled: M. Hughes**



**Horticulture Australia**



**Public**

# Horticulture Australia Project PT01044

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This is the **final report** on the project **Evaluation of Internationally Bred Potatoes**.  
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# Evaluation of Internationally Bred Potatoes

## Final Report (Public)

Compiled and edited by: M. Hughes

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# Media Summary

A series of trials was conducted in 2001 and 2002 to assess the suitability of 17 internationally commercial varieties to tropical and sub-tropical potato production regions in Australia.

The trials indicated that these varieties might have a role to play in the Australian potato industry. The proprietary line Valor, even when grown in adverse conditions was able to produce yields of 62.39 t/ha. Under ideal conditions this variety produced yield as high as 85.89 t/ha.

Other international varieties that showed potential in the trials were Argos, Harmony, Redgem and Kestrel.

# Technical Summary

Four replicated field trials were conducted to assess the suitability of 17 internationally commercial potato varieties to tropical and sub-tropical potato production regions in Australia.

The trials indicated that these varieties might have a role to play in the Australian potato industry. The proprietary line Valor, even when grown in adverse conditions was able to produce yields of 62.39 t/ha, while under ideal conditions it achieved 85.89 t/ha. This variety is suitable for the fresh, brushed market.

Argos and Harmony were other white skin varieties that showed some potential for fresh market production. Of the red skin potatoes tested, Redgem showed some potential. Kestrel continually showed potential as a dual purpose (fresh/processing) type potato and Sini, while only grown in one trial may have processing ability.

# 1. Introduction

Private sector companies are introducing internationally commercial potato varieties to Australia. During 2001 and 2002 this project scientifically and objectively evaluated the suitability of 17 of these imported internationally commercial potato varieties to growing conditions in tropical and sub-tropical regions of Australia. Comparisons were also made with the Australian commercial varieties currently used in these regions.

## 2. Materials and Methods

Each year of the project two trial sites were chosen, one in a tropical region and the other in the sub-tropics, (Table 1). The actual sites chosen were in areas in their main planting windows when the majority of the trial seed had reached optimum planting condition.

**Table 1. Project trial sites.**

Year	Trial Sites	
	Tropical region	Sub-tropical region
2001	Evelyn Central (Atherton Tablelands)	Gatton (Lockyer Valley)
2002	Kairi (Atherton Tablelands)	Tannymorel (Darling Downs)

In 2001 Elders PTY LTD made available seed from 8 of their proprietary varieties for the tropical (north Queensland (NQ)) trial. These were compared with Atlantic and the Australian bred line 92-19-10. 10 varieties were available for the sub-tropical (southeast Queensland (SQ)) trial, and were compared with Sebago, Atlantic and Red La Soda. In 2002 Elders PTY LTD made available seed from 14 of their proprietary varieties for the NQ trial. These were compared with the commonly grown varieties, Atlantic, Pontiac and Sebago. 15 varieties were available for the SQ trial, and were compared with Atlantic, Desiree and Sebago. Refer to table 2 for planting dates.

In both years the NQ trial was grown on red kraznozem soils that had just come out of 5 years of pasture grass. The SQ 2001 trial was grown on a well drained well mulched black alluvial soil which had been cover cropped with sorghum, while the 2002 trial was grown on a similar soil which had been cover cropped with lucerne.

Design of all trials was as randomised complete blocks, with NQ having 4 replications and SQ trials 3. Plot lengths were approximately 10m, planting width varied with the standards for the areas (NQ 91.4cm, Gatton 75cm and Tannymorel 81.3cm) and tuber spacing was 25cm. Where seed size permitted seed was planted as round seed. Where cutting was required seed was planted at the same whole/cut ratio as dictated by the seed size ratio (round/cutting) of the seed provided. Basal fertilizer was applied as required (refer appendixes I & II) and foliar applications of boron and zinc made. Harvest was decided on visual assessment of overall trial maturity (Table 2). When possible field days were conducted prior to or at harvest.

**Table 2. Trial planting, harvest and field day dates.**

Trial	Planting Date	Harvest Date	Field Days
<b>2001</b>			
Evelyn Central	6 August	29&30 November	29 November
Gatton	10 July	16 November	7 November
<b>2002</b>			
Kairi	7 July	30 October	31 October
Tannymorel	29 August	17&18 December	-

## 3. Results

### 3.1 NQ Trials 2001 & 2002

In both 2001 and 2002 trials, significant variety effects were shown for both total tuber yields and marketable yields (120-350g), (Table 3). Significant variety effects were also shown in both years in the tuber ranges of 70-120g and >350g (appendix I & II). In both years Valor was the highest yielding variety achieving total yields in excess of 80 t/ha and marketable yields above 58t/ha. Following Valor; Argos, Redgem and Kestrel were the next highest yielding varieties. While Harmony did not perform well in the 2001 trial, (due to seed not being well shot for planting), it achieved a yield of 80.65 t/ha in the 2002 trial, giving it third place ranking. Overall the standard varieties, Sebago, Pontiac and Atlantic were not significantly different to Redgem and Kestrel. The results for variety Celine are probably not indicative of its true potential as there was not enough quantity of seed for full plot plantings, the seed was still dormant when planted and it did suffer from rots before emergence.

**Table 3. North Queensland Yield Results**

Variety	2001 Trial			2002 Trial		
	Total Yield (t/ha)	Marketable Yield (120g-350g) (t/ha)	% Marketable Yield	Total Yield (t/ha)	Marketable Yield (120g-350g) (t/ha)	% Marketable Yield
Valor	81.92 g	58.29 d	71.1	85.89 g	61.41 h	71.5
Argos	70.91 f	43.26 bc	61.0	85.45 g	51.93 fg	60.8
Redgem	68.81 ef	50.80 cd	73.8	60.25 f	43.81 def	72.7
Kestrel	66.31 def	48.03 c	72.4	59.47 f	42.96 de	72.2
Sebago	-	-	-	58.13 f	44.47 def	76.5
Pontiac	-	-	-	55.64 ef	38.14 cd	68.5
Heather	63.75 cdef	47.87 c	75.1	-	-	-
Winston	62.11 cde	40.01 b	64.4	-	-	-
Atlantic	58.10 bcd	49.29 c	84.8	59.22 f	48.31 efg	81.2
Harmony	57.80 bc	37.15 ab	64.3	80.65 g	56.31 gh	69.8
92-19-10	51.53 ab	30.42 a	59.0	-	-	-
Nadine	46.17 a	35.64 ab	77.2	-	-	-
Inova	-	-	-	52.84 def	39.36 d	74.5
Keuka Gold	-	-	-	48.08 cde	36.58 cd	76.1
Mondial	-	-	-	45.11 cd	25.95 b	57.5
Saxon	-	-	-	44.35 cd	30.95 bc	69.7
St. John	-	-	-	39.95 c	27.55 b	69.0
Admiral	-	-	-	39.47 c	25.82 b	65.4
White Lady	-	-	-	21.03 b	11.45 a	54.4
Rioja	-	-	-	18.43 ab	11.40 a	61.9
Celine	-	-	-	10.04 a	6.39 a	63.6
	<i>LSD = 8.485    LSD = 7.641</i>			<i>LSD = 9.664    LSD = 8.233</i>		

NB: Means with the same subscript are not significantly different at the 5% level.

None of the varieties tested was able to compete with Atlantic (processing standard) for specific gravity. Kestrel, the proprietary variety that attained the highest specific gravity, still only recorded 1.083 and 1.080 compared to Atlantic's 1.096 and 1.097. Kestrel's specific gravity (Sg) was significantly higher than that of Sebago (1.066), the current multipurpose variety. (Note: Sg of Sebago while not unknown at this reading is often in the range of 1.075 or higher in NQ trials – Hughes pers com.). Valor, the highest yielding variety in the trial recorded a specific gravity of 1.076 and 1.065 (Table 4).

**Table 4. North Queensland trial – specific gravities**

	2001	2002
Variety	Specific Gravity	Specific Gravity
Atlantic	1.096 e	1.097 I
Kestrel	1.083 d	1.080 h
Redgem	1.081 cd	1.071 fg
Valor	1.079 c	1.065 bc
92-19-10	1.079 c	-
Heather	1.074 b	-
Keuka Gold	-	1.078 h
Rioja	-	1.078 h
St. John	-	1.074 g
Celine	-	1.071 efg
White Lady	-	1.070 ef
Inova	-	1.069 def
Pontiac	-	1.068 cde
Sebago	-	1.066 bcd
Nadine	1.066 a	-
Argos	1.066 a	1.060 a
Saxon	-	1.066 bcd
Admiral	-	1.064 bc
Mondial	-	1.063 ab
Winston	1.063 a	-
Harmony	1.063 a	1.061 a
	<i>LSD = 0.003926</i>	<i>LSD = 0.003391</i>

NB: Means with the same subscript are not significantly different at the 5% level

Tuber shape of all varieties was acceptable for the fresh market.

Kestrel the proprietary variety that showed most processing potential has an oval/long shape, which while not the preferred choice of the crisping industry, is not dissimilar to that of Sebago, a current dual purpose variety. Kestrel has a white skin with purple eyes/eyebrows, which may or may not be attractive to consumers.

Valor, the highest yielding variety has a slightly russeted skin, which is not as attractive as many of its rivals. Argos and Harmony showed promise as fresh market varieties for both washed and brushed market, although seed from both varieties appears to have a long dormancy period. Agronomic management may be required to reduce the tendency for Harmony to develop hollow heart. Redgem, a shallow eyed, pink skin, white flesh variety yielded well although not statistically different to the red standard, Pontiac, and it showed a similar tendency toward hollow heart.

Winston was the highest yielding yellow flesh variety, followed by Inova.

### 3.2 SQ Trials 2001 & 2002

In both 2001 and 2002 trials, significant variety effects were shown for both total tuber yields and marketable yields (120-350g), (Table 5). Significant variety effects were also shown in both years in the tuber ranges of <70g, 70-120g and >350g (appendix I & II). In both years Valor produced a yield in excess of 20 t/ha greater than its nearest rival, Argos in 2001 and Sini in 2002. Sini while achieving a total yield of 56.10 t/ha only produced 18.07 tonne of it in the 120g-350g tuber size range, (Table 5). 38.6% of Sini's yield was in the 70g-120g range and 29.2% in the <70g. (refer appendix II). Argos and Kestrel were the other proprietary lines that performed well, although in these trials their yields were not

significantly different to the standard varieties, Desiree, Atlantic and Sebago. Keuka Gold and Winston were the best of the yellow flesh varieties.

**Table 5. South Queensland Yield Results**

Variety	2001 Trial			2002 Trial		
	Total Yield (t/ha)	Marketable Yield (120g-350g) (t/ha)	% Marketable Yield	Total Yield (t/ha)	Marketable Yield (120g-350g) (t/ha)	% Marketable Yield
Valor	62.39 f	47.75 g	76.5	79.06 e	56.99 f	72.1
Sini	-	-	-	56.10 d	18.07 b	32.2
Desiree	-	-	-	55.34 d	34.30 e	62.0
Argos	39.59 cde	26.52 ef	67.0	53.76 cd	35.47 e	66.0
Atlantic	34.28 bcde	25.35 ef	73.9	53.63 cd	35.77 e	66.7
Kestrel	41.78 de	30.13 f	72.1	47.89 bcd	32.60 de	68.1
Sebago	32.27 bcd	24.13 def	74.8	47.81 bcd	30.48 cde	63.8
Keuka Gold	-	-	-	44.14 abcd	21.52 bc	48.8
Winston	40.86 de	31.57 f	77.3	-	-	-
Nadine	30.67 bc	15.5 cd	50.5	40.49 abc	16.73 ab	41.3
St. John	-	-	-	40.46 abc	26.67 bcde	65.9
Redgem	40.02 cde	19.71 cde	49.3	40.03 abc	22.71 bcd	56.7
Saxon	18.97 a	6.32 ab	33.3	39.39 ab	18.27 b	46.4
Heather	39.14 cde	27.56 ef	70.4	-	-	-
Harmony	16.32 a	5.63 a	34.5	38.55 ab	19.61 b	50.9
White Lady	-	-	-	37.33 ab	6.69 a	17.9
Rioja	-	-	-	37.28 ab	17.30 ab	46.4
Mondial	28.53 b	14.81 bc	51.9	36.17 ab	20.10 bc	55.6
Admiral	-	-	-	34.10 ab	20.40 bc	59.8
Inova	-	-	-	33.83 a	17.46 b	51.6
	<i>LSD = 9.546</i>	<i>LSD = 8.703</i>		<i>LSD = 13.94</i>	<i>LSD = 10.72</i>	

NB: Means with the same subscript are not significantly different at the 5% level.

Under south Queensland's hot dry growing conditions of 2001 the standard variety, Sebago showed moderate signs of brown fleck while Red La Soda expressed slight signs. The proprietary varieties Winston, Heather and Mondial also exhibited slight signs of fleck. Harmony was the only variety to show signs of hollow heart. Although 2002 was another harsh year fleck was not a problem in the trial.

Tuber shape for all varieties was acceptable for the fresh market. Keuka Gold showed a strongly russeted skin that would be unsuitable for washed market. The skin of Valor, the highest yielding variety, did show some variation between 2001 (smooth skin) and 2002 (slight russet).

## 4. Discussion

These trials indicate that internationally commercial varieties do have a role to play in the Australian potato industry. The proprietary variety Valor proved itself to be a highly productive with wide adaptability to growing conditions. Valor was significantly the highest yielding (both total and marketable yields) variety tested in the trials that had conditions ranging from ideal to quite adverse. Under harsh hot dry conditions (Gatton 2001), Valor was able to produce yields of 62.39 t/ha (47.75 t/ha marketable) while in ideal ones (Kairi 2002), the yields rose to 85.89 t/ha (61.41 t/ha marketable). These

yields are significantly higher than Sebago's 32.27 t/ha (24.13 t/ha marketable) and 58.13 t/ha (44.47 t/ha marketable) respectively.

Valors' role would be as a fresh market washed potato. Its skin texture can vary from smooth to slightly russeted and therefore would probably not compete well with some of the current smooth skin washed varieties. Valor has no potential for french fry or crisping industries.

Argos is another proprietary variety that continually showed potential as a fresh market variety, again it would probably be best in the brushed market as is its skin varies from smooth to having a slight russet. It also has no processing potential.

Harmony seed has a long dormancy period, and while it did not perform well in most trials (probably due to seed maturity at planting) it achieved a yield of 80.65 t/ha (56.31 t/ha marketable) in the Kairi trial. This variety may fit into the washed fresh market as it has a very smooth bright skin.

Of the redskin varieties tested Redgem was a consistent performer although it was not significantly better than the standard varieties. It does have the advantage of having shallow eyes in comparison to those of Red la Soda and Pontiac, while its disadvantages are that its skin colour is a light red/pink and it may suffer from hollow heart and powdery scab.

Sini was only grown in one trial (Darling Downs 2002) and although it produced a high yield only, 32.2 % was in the marketable range of 120-350g tubers, with a further 38.6% in the range of 70-120g. It appears to have some processing potential and probably should be further studied. Kestrel fits closer to the dual purpose (fresh market/processing) category. It equalled or outyielded Sebago (current dual purpose variety) although not significantly in trials and continually achieved higher specific gravity measurements. The downsides of Kestrel are that it has a slightly longer flatter shape than does Sebago and it has purple coloured eyes and eyebrow. Concern was raised at the field days that consumers would not want to purchase this potato because "it looks different to Sebago" and may not go over graders as well due to its flatter shape.

Of the yellow fleshed varieties grown, Keuka Gold was the most consistent at the different trial sites. Inova, another yellow fleshed variety grew well in the Kairi trials but failed to perform in the Darling Downs trials. Yellow fleshed varieties would have to be grown for specialised niche markets as they did not appeal to buyers or growers who attended the field days.

Agronomically, proprietary varieties have shown they can have a role in the Australian potato industry. Producers at field days immediately identified Valor as a variety they would like to grow, and Argos as one that held their interest. The main concern expressed by both producers and buyers was that market price discrimination against the new varieties would destroy the viability of growing them. They believed this would particularly apply to varieties such as Redgem and Kestrel, which are quite different from the industry standards of Pontiac and Red la Soda for red skins and Sebago for a dual purpose lines.

## 5. Technology Transfer

Three field days were conducted during this project (Table 6). The field days were held as near as possible to trial harvests so attendees could gain a true appreciation of the potential of the varieties being trialled. Local producers, buyers and agribusiness were invited to attend these days.

**Table 6. Project Field Days**

Date	Site
7 November 2001	Gatton Research Station, (Lockyer Valley)
29 November 2001	Evelyn Central (Atherton Tablelands)
7 November 2001	Kairi Research Station (Atherton Tablelands)

In addition to field days, results from the project were provided to Elders Pty.Ltd. personnel for dissemination through their extensive network of agronomists.

## **6. Recommendations**

This project has shown that internationally commercial lines have the capacity to play a role in the Australian potato industry.

Any further variety testing projects should include internationally commercial lines available in country as this work has shown they have the capability to produce significantly higher yields than current industry standards.

# Acknowledgments

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Finally, we would like to express our appreciation to Joanne De Faveri for undertaking the statistical analysis, and Lesley Adams for assistance in the report layout.

# Appendix I

## North Queensland Yield Results - 2001

Variety	Total Yield (t/ha)	Marketable Yield (120g-350g) (t/ha)	% Marketable Yield	% Small <70g	% Seed (70-120g)	% Oversize >350g	% Rots
Valor	81.92 g	58.29 d	71.1	2.3	6.5	12.8	7.3
Argos	70.91 f	43.26 bc	61.0	2.2	6.2	24.9	5.7
Redgem	68.81 ef	50.80 cd	73.8	4.7	10.8	7.5	3.2
Kestrel	66.31 def	48.03 c	72.4	3.8	11.7	11.0	1.1
Heather	63.75 cdef	47.87 c	75.1	4.1	16.0	3.4	1.4
Winston	62.11 cde	40.01 b	64.4	2.5	6.8	24.4	1.9
Atlantic	58.10 bcd	49.29 c	84.8	2.1	9.6	1.7	1.8
Harmony	57.80 bc	37.15 ab	64.3	3.4	10.7	18.4	3.2
92-19-10	51.53 ab	30.42 a	59.0	13.3	12.0	12.5	3.2
Nadine	46.17 a	35.64 ab	77.2	3.7	14.0	3.3	1.8
	<i>LSD = 8.485</i>	<i>LSD = 7.641</i>					

NB: Means with the same subscript are not significantly different at the 5% level.

## South Queensland Yield Results - 2001

Variety	Total Yield (t/ha)	Marketable Yield (120g-350g) (t/ha)	% Marketable Yield	% Small <70g	% Seed (70-120g)	% Oversize >350g
Valor	62.39 f	47.75 g	76.5	2.6	14.6	6.3
Red La Soda	42.90 e	31.25 f	72.8	4.9	15.8	6.5
Kestrel	41.78 de	30.13 f	72.1	6.3	19.4	2.2
Winston	40.86 de	31.57 f	77.3	4.2	14.5	4.0
Redgem	40.02 cde	19.71 cde	49.3	11.0	39.3	0.4
Argos	39.59 cde	26.52 ef	67.0	7.7	18.5	6.8
Heather	39.14 cde	27.56 ef	70.4	5.2	21.5	2.9
Atlantic	34.28 bcde	25.35 ef	73.9	4.2	19.3	2.6
Sebago	32.27 bcd	24.13 def	74.8	5.7	15.5	4.0
Nadine	30.67 bc	15.50 cd	50.5	16.4	32.3	0.8
Mundial	28.53 b	14.81 bc	51.9	12.7	30.6	4.8
Saxon	18.97 a	6.32 ab	33.3	23.2	43.5	0.0
Harmony	16.32 a	5.63 a	34.5	34.7	29.7	1.1
	<i>LSD = 9.546</i>	<i>LSD = 8.703</i>				

NB: Means with the same subscript are not significantly different at the 5% level.

# Appendix II

## North Queensland Yield Results - 2002

Variety	Total Yield (t/ha)	Marketable Yield (120g-350g) (t/ha)	% Marketable Yield	% Small <70g	% Seed (70-120g)	% Oversize >350g	% Rots
Valor	85.89 g	61.41 h	71.5	2.1	9.4	15.7	1.3
Argos	85.45 g	51.93 fg	60.8	2.9	6.3	28.7	1.3
Harmony	80.65 g	56.31 gh	69.8	5.5	11.2	12.3	1.2
Redgem	60.25 f	43.81 def	72.7	4.4	13.8	7.8	1.4
Kestrel	59.47 f	42.96 de	72.2	4.7	11.4	10.9	0.7
Atlantic	59.22 f	48.31 efg	81.2	1.7	7.3	8.2	1.3
Sebago	58.13 f	44.47 def	76.5	4.6	13.3	4.1	1.6
Pontiac	55.64 ef	38.14 cd	68.5	5.3	8.7	13.6	3.9
Inova	52.84 def	39.36 d	74.5	2.9	12.8	8.6	1.2
Keuka Gold	48.08 cde	36.58 cd	76.1	3.8	12.6	5.6	1.9
Mondial	45.11 cd	25.95 b	57.5	3.0	10.2	28.2	1.0
Saxon	44.35 cd	30.95 bc	69.7	7.4	17.5	4.6	0.7
St. John	39.95 c	27.55 b	69.0	3.6	10.3	13.8	3.3
Admiral	39.47 c	25.82 b	65.4	4.1	13.3	12.8	4.4
White Lady	21.03 b	11.45 a	54.4	12.8	29.5	2.7	0.7
Rioja	18.43 ab	11.40 a	61.9	8.8	26.5	0.6	2.2
Celine	10.04 a	6.39 a	63.6	8.8	25.4	0.0	2.2
	<i>LSD = 9.664</i>	<i>LSD = 8.233</i>					

NB: Means with the same subscript are not significantly different at the 5% level.

## South Queensland Yield Results - 2002

Variety	Total Yield (t/ha)	Marketable Yield (120g-350g) (t/ha)	% Marketable Yield	% Small <70g	% Seed (70-120g)	% Oversize >350g
Valor	79.06 e	56.99 f	72.1	6.8	15.2	5.9
Sini	56.10 d	18.07b	32.2	29.2	38.6	0.0
Desiree	55.34 d	34.30 e	62.0	8.3	20.1	9.6
Argos	53.76 cd	35.47 e	66.0	6.0	8.2	19.8
Atlantic	53.63 cd	35.77 e	66.7	5.9	20.9	6.4
Kestrel	47.89 bcd	32.60 de	68.1	9.6	17.0	5.3
Sebago	47.81 bcd	30.48 cde	63.8	10.4	22.6	3.3
Keuka Gold	44.14 abcd	21.52 bc	48.8	15.3	31.3	4.6
Nadine	40.49 abc	16.73 ab	41.3	26.7	31.9	0.0
St John	40.46 abc	26.67 bcde	65.9	8.2	17.2	8.8
Redgem	40.03 abc	22.71 bcd	56.7	15.4	22.9	4.9
Saxon	39.39 ab	18.27 b	46.4	17.3	34.8	1.5
Harmony	38.55 ab	19.61 b	50.9	17.1	31.1	1.0
White Lady	37.33 ab	6.69 a	17.9	47.6	33.5	1.1
Rioja	37.28 ab	17.30 ab	46.4	19.2	34.4	0
Mondial	36.17 ab	20.10 bc	55.6	14.1	26.2	4.2
Admiral	34.10 ab	20.40 bc	59.8	10.6	21.0	8.6
Inova	33.83 a	17.46 b	51.6	20.0	25.6	2.8
	<i>LSD = 13.94</i>	<i>LSD = 10.72</i>				

NB: Means with the same subscript are not significantly different at the 5% level.