



## **Research Report**

# **Storage Assessment of Independent Variety Trials 2003-04 and 2004-05 trials**

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## Summary

Twenty-one varieties of potato, which had been grown at two geographically different sites each season, were stored at Sutton Bridge Experimental Unit immediately following harvest. After a period of approximately 6 months, the tubers were assessed for a range of diseases and quality traits. New varieties were compared with standard varieties within each class (salad and second earlies, maincrop ware and crisping varieties) and a rating calculated for each of the main traits.

The new ware varieties, Axona, Mira, Paramount and Sunset, had reasonable resistance to silver scurf, black dot, skin spot and black scurf (performing as well, or better, than the control for each disease). The only crisping variety, Tay, performed as well as the control, Lady Rosetta, in terms of fry colour. However, Tay had a moderate level of spraing in tubers grown at the Scottish site in the 2004-05 season. No French frying varieties were entered in the storage trial in 2004-05.

Following contract review in 2004, storage trials within the IVT programme have now been discontinued. Varieties in their first year of evaluation in 2004-05, i.e. 86F 2.2, Axona, Gasore, Mira and Hunter (RB386), will therefore not complete their second-year storage evaluation.

## Introduction

The purpose of the Independent Variety Trials (IVT) programme is to generate detailed agronomic information on new potato varieties to complement the statutory information produced by the National List tests. Varieties evaluated in the IVT process are normally subjected to three years of field tests at two sites in Great Britain and two years of storage evaluation. However, following review of the IVT trials system in 2004, the storage trials have been discontinued at the end of the 2004-05 season.

The field evaluations for the series of trials reported here were conducted by NIAB, Cambridge and SAC, Aberdeen. In addition, during the second and third year of the test programme, varieties were held at the British Potato Council's Sutton Bridge Experimental Unit (SBEU) and evaluated for a range of post-harvest characteristics before and after storage. These include the incidence and severity of diseases, the occurrence of physiological defects which may affect the processing quality of varieties, and the effect of storage on the overall appearance of the tubers.

This report covers those varieties assessed at SBEU in 2003-04 and 2004-05.

## **Materials and methods**

### ***Details of varieties for assessment***

Potatoes were grown from common-origin seed tubers produced by NIAB at a single site. Crops for testing were grown according to local best practice in separate plots at two sites for the Independent Variety Trial programme: The site managed by NIAB was at Elveden, Suffolk and that managed by SAC at Laurencekirk, Kincardineshire.

Details of the new potato varieties, along with the control varieties, including information on the number of years they have been included in the IVT trials, maturity group, end use group, agent/ breeder and storage temperature are given in Table 1. The dates on which the tubers were loaded into store at SBEU are given in Table 2.

TABLE 1. POTATO VARIETIES INCLUDED IN IVT 2004-05

<b>SET SKIN SMALL</b>						
Trial	AFP 4/	Code	Maturity/ use	Status	Variety	Breeder/Agent
SE/MC		AG	SE punnet	Control	Charlotte	
SE/MC		AH	SE punnet	Control	Nicola <sup>1</sup>	
		-	SE punnet	Control*	Maris Peer <sup>1</sup>	
	667		salad	3	Bernadette	L Taylor
			salad	2	Gasore	J Mara
	686		salad	2	86 F 2.2	Higgins

<b>SECOND EARLY/MAINCROP</b>						
Trial	AFP 4/	Code	Maturity/ use	Status	Variety	Breeder/Agent
SE/MC	60	AC	SE	Control	Estima	AGRICO
SE/MC	113	AD	MC	Control	Maris Piper	
SE/MC	150	AE	MC	Control	Desiree	
SE/MC	395	AF	MC	Control	Lady Rosetta	MBM
				3	Rembrandt	MBM
	674			3	Sunset	Agrolon
	688			3	90-60-27	Agrolon
	689			3	93-01-02	Agrolon
	656			3	Paramount	J Mara IPB
	678			3	AD 12 (Aldo)	A Dobbin
	655			2	RB 386/Hunter	R Brady
	645		crisping	3	Tay	SCRI
	485			3	Robinta	A Skea
	693			2	Axona	SARPO
	668			2	Mira	SARPO

\* new control added to trial

<sup>1</sup> standard varieties included for continuity of data but not used in comparisons in these seasons' trials.

TABLE 2. STORE LOADING DATES AND STORAGE DURATION

Site	Loading date		Storage duration (weeks)	
	2003-04	2004-05	2003-04	2004-05
SAC, Kincardineshire	16 October 2003	7 October 2004	24	26
NIAB, Suffolk	12 September 2003	14 September 2004	28	24



## Storage

Potatoes were delivered to SBEU where they were hand graded to remove tubers with a diameter less than 45mm or greater than 80 mm. Three sub-samples, consisting of approx. 10 kg of tubers, were selected at random and placed in plastic trays and weighed prior to loading into store.

All samples were held in controlled environment rooms for long-term storage. They were cured for two weeks at 12°C and ambient humidity, before being cooled down, at 0.5°C per day, until they reached holding temperature. Salad, second early and maincrop ware varieties were held at 4°C and processing (i.e. crisping) varieties at 8°C (Table 1).

Relative humidity (RH) was maintained at 95% (+/- 5%) during the holding period by ultrasonic atomising nozzles and electric dehumidification. Crop temperature and store RH are recorded and controlled automatically by computer [Cornerstone Systems Ltd., Stone, ST15 0SD].

Sprouting was controlled by applying CIPC as a thermal fog (*MSS CIPC 50M* at 42.5ml/t, Whyte Agrochemicals Ltd, Huddersfield, HD7 5QE) using a *Swingfog SN50* machine [Allman Sprayers Ltd, Chichester, PO20 7BT]. Potatoes were temporarily transferred to gassing chambers for approximately 8 hours for this operation. The dates of CIPC applications are given in Table 3. The varieties stored at 4°C did not require a sprout suppressant treatment during 2004-05 storage season.

TABLE 3. CIPC APPLICATION DATES

Storage temperature	Season	
	2003-04	2004-05
4 C	12 January 2004	No application
8 C	12 January 2004	23 December 2004

Samples were arranged in store in blocks by site, but unloaded on a fully randomised schedule according to end-use group in the order: second earlies & salads; maincrop and processing varieties. In the 2003-04 season, tubers were unloaded on 29<sup>th</sup> March 2004 (NIAB Samples) and 5<sup>th</sup> April 2004 (SAC samples) and in the 2004-05 season, tubers were unloaded on 28<sup>th</sup> February (NIAB samples) and 4<sup>th</sup> April (SAC samples).

## Assessments

Assessments were carried out at store loading and after long-term storage. All varieties were assessed for dry matter content and weight loss. Ware tubers were assessed for the level of silver scurf, black dot and black scurf. Crisping varieties were assessed for internal defects and fry colour using a Hunter Lab colour meter [Kirstol Ltd., Stalybridge, SK15 2BT] Methods are detailed in Appendix 1.

## **Study design**

Both trials had split-plot designs in-store with site in whole ‘plots’ and variety in ‘sub-plots’. Samples for processing assessments and pathological assessments were held in separate blocks.

## **Varietal ratings**

Ratings were generated for the blemish diseases, silver scurf, black dot and black scurf, for ware varieties. Ratings were also generated for weight loss and fry colour. Ratings ranged between 1 and 9, where 9 represented desirable disease or agronomic traits.

Appropriate transformations were determined from analysis of residuals from analysis of variance. Square root transformation was used for disease and weight loss data but fry colour data (Hunter Lab value) were not transformed. Ratings were then calculated using the formulae set out below. Ratings for the control varieties, used in the calculations, are given in Table 4.

Ratings were calculated as follows:

### Silver scurf, black dot, black scurf and weight loss

$$\text{Rating} = 9 - ((9 - C_y) / C_x) \times T_x$$

### Fry colour

$$\text{Rating} = 9 - (9 - C_y) / (C_z - C_x) \times (C_z - T_x)$$

Where

$C_x$  = Mean disease, weight loss or Hunter Lab for control variety

$C_y$  = Rating for control variety (mean of three control varieties used for ware)

$C_z$  = Maximum fry colour value for Hunter Lab (75) and linearised USDA (7)

$T_x$  = Mean disease, weight loss or fry colour for test variety

TABLE 4. CONTROL VARIETY RATINGS USED TO CALCULATE THE RATINGS FOR THE TEST VARIETIES

Variety	Assessment					
	Weight loss	Fry colour	Silver scurf	Black dot	Black scurf	Skin spot
Estima	6	4	4	5	6	6
Maris Piper	5	5	6	4	6	4
Desiree	6	5	7	5	6	4
Charlotte	3	-	7	6	7	9
Nicola	5	-	8	9	4	9
Lady Rosetta	6	6	-	-	-	4

### ***Control varieties***

In most cases the varieties used as controls have been included in the IVT assessments since the BPC programme began in 1997, although the crisping control variety Lady Rosetta was not introduced until 1999. All three maincrop ware control varieties were used to generate ratings for test maincrop ware varieties for the first time in 2005.

Charlotte was included as a specific control for the salad variety trials from 2000. This variety was used for calculating ratings for the first time in 2002.

## Results

Mean disease and quality results for all varieties for the two years are given in Tables 5 and 6 respectively. More detailed results showing disease and quality results for each site are given in Appendices 2 to 4.

### ***Notes on Independent Variety Trials***

Site effects:

IVT crops were grown by NIAB at a site at Elveden, Suffolk and by SAC at a site at Laurencekirk, Kincardineshire in both the 2003-04 and 2004-05 seasons, in order to reduce site-specific effects. The two year means are calculated from the total data set available.

Fry colour:

Hunter Lab (crisps) values and ratings are given for fry colour in Table 6. Data for each site are shown in Appendix 3.

Sprouting:

Sprouting was controlled throughout the storage trials.

### ***Notes on test varieties in trial***

#### **Second early varieties:**

No second early, non-salad, varieties were tested in either year.

#### **Salad variety:**

##### Bernadette

A long oval tuber with white skin and light yellow flesh. This variety had low dry matter content (16.8%) and moderate/high weight loss (rating 4). However, the weight loss in the test variety was comparable with that of the control, Charlotte. Bernadette demonstrated excellent resistance to black scurf and skin spot (rated 9 for both) and moderate resistance to black dot and silver scurf (rated 6 and 7 respectively).

##### Gasore

A partially coloured variety suitable for salads. This variety had medium dry matter content (19.6%) and high weight loss (rated 3). However, the weight loss in the test

variety was comparable with that of the control, Charlotte. Gasore had excellent resistance to silver scurf and skin spot (rated 8 and 9 respectively). Resistance to black dot and black scurf was moderate (rated 6 for both).

#### 86F2.2

A red skinned variety suitable for salads. This variety had medium dry matter content (19.0%) and low weight loss (rated 7). Resistance to black scurf and skin spot was excellent (rated 9 for both). Resistance to silver scurf was moderate (rated 7). However, the variety was moderately susceptible to black dot (rated 5).

### **Maincrop ware varieties:**

#### 90-60-27

A short oval tuber with white skin and cream flesh. This variety had low dry matter content (15.1%) and moderate weight loss (rating 4). It was moderately resistant to silver scurf, black dot and skin spot (rated 6, 6 and 7 respectively) but had poor resistance to black scurf (rated 1).

#### 93-01-02 (Nadia)

Red skinned, long oval tubers with cream flesh. Nadia had a medium dry matter content (18.2%) and moderate weight loss (rating 5). This variety was moderately resistant to silver scurf and black dot (rated 7 and 6 respectively) and moderately susceptible to skin spot and black scurf (rated 4 for both).

#### AD12 (Aldo)

Long oval tubers with cream flesh. This variety had a medium/high dry matter content (20.8%) and high weight loss (rating 3). Aldo was moderately resistant to silver scurf (rating 7) and moderately susceptible to black dot and skin spot (rated 5 and 4 respectively). However, this variety was susceptible to black scurf (rated 2).

#### Axona<sup>1</sup>

A long oval tuber with red skin and cream flesh. This variety had a high dry matter content (21.6%, highest in its group) and moderate weight loss (rating 5). Axona had good/moderate resistance to black scurf and silver scurf (rating 8 and 7 respectively) but was moderately susceptible to black dot and skin spot (rating 5 for each).

#### Mira<sup>1</sup>

An oval tuber with red skin and white flesh. This variety had a high dry matter content (21.0%) and moderate weight loss (rating 4). Mira had good resistance to black dot (rated 8) and moderate resistance to silver scurf, black scurf and skin spot (rated 7, 7, 6 respectively).

#### Paramount

Long oval tubers with red skins and white/cream flesh. This variety had a medium dry matter content (18.1%) and moderate weight loss (rating 5). Paramount showed moderate

<sup>1</sup> Variety completing one year's trial

resistance to black dot, silver scurf, black scurf and skin spot (rated 6, 6, 5 and 6 respectively).

#### Rembrandt

An oval tuber with white skin and cream flesh. This variety had a medium/high dry matter content (20.7%) and moderate weight loss (rating 4). Rembrandt had excellent resistance to black scurf (rating 9), moderate resistance to silver scurf and skin spot (rated 6 and 7 respectively). However, this variety was fairly susceptible to black dot (rated 3).

#### RB386 (Hunter)<sup>1</sup>

A round oval tuber with white skin and light yellow flesh. This variety had a medium/high dry matter content (18.5%) and high weight loss (rated 3). Hunter had excellent resistance to silver scurf and skin spot (rated 8 and 9 respectively), moderate susceptibility to black dot (rated 5) but was very susceptible to black scurf (rated 1).

#### Robinta

Red skinned, long oval tubers with cream flesh. This variety had a medium/high dry matter content (20.5%) and moderate weight loss (rating 5). Robinta showed moderate resistance to silver scurf (rated 6), moderate susceptible to black dot and skin spot (rating 5), but was very susceptible to black scurf (rating 2).

#### Sunset

Red skinned, long oval tubers with cream flesh. This variety had a low/medium dry matter content (17.5%) and moderate weight loss (rating 5). Sunset exhibited moderate resistance to silver scurf, black scurf and skin spot (rated 7, 7 and 6 respectively) and moderate susceptibility to black dot (rating 5).

### **Crisping varieties:**

#### Tay

Partially-coloured, long oval tubers with cream flesh. Tay had a high dry matter content (22.7%) and moderate weight loss (rating 6). The fry colour was comparable with that of the control variety (Lady Rosetta). Tay has been particularly susceptible to spraing when grown at the Scottish site – 37% of tubers were affected in 2004-05.

<sup>1</sup> Variety completing one year's trial

TABLE 5. AFTER STORAGE DISEASE ASSESSMENT RESULTS (MEAN) AND RATINGS FOR SALAD AND WARE VARIETIES INCLUDED IN INDEPENDENT VARIETY TRIALS (2003-2005)

Use	Variety	Silver scurf		Black dot		Skin spot		Black scurf	
		%SA	Rating	%SA	Rating	Incidence	Rating	Incidence	Rating
<b>Salad</b>	Charlotte (C)	2.9	7	3.0	6	2.3	9	29.0	<b>7</b>
	Nicola (S)	0.5	8	0.3	9	10.0	9	32.7	<b>4</b>
	Maris Peer (S)	2.3	–	7.8	–	1.3	–	1.3	–
	Bernadette	3.7	7	2.3	6	3.3	9	4.3	9
	Gasore <sup>1</sup>	0.8	8	3.6	6	0.7	9	62.7	6
	86F 2.2 <sup>1</sup>	2.5	7	6.8	5	0.7	9	0.0	9
<b>Second early/ Maincrop</b>	Estima (C)	13.4	4	7.3	5	7.3	6	1.7	<b>6</b>
	Maris Piper (C)	5.3	6 <sup>†</sup>	2.3	4	21.0	4	0.4	<b>6</b>
	Desiree (S) <sup>r</sup>	1.7	7	3.2	5	40.7	4 <sup>†</sup>	12.0	<b>6</b>
	<b>90-60-27</b>	5.4	6	1.6	6	6.3	7	74.3	1
	<b>93-01-02</b> <sup>r</sup>	1.9	7	2.2	6	35.0	4	15.3	4
	<b>Aldo</b>	3.0	7	3.4	5	26.0	4	25.3	2
	<b>Axona</b> <sup>1,r</sup>	2.4	7	3.9	5	21.3	5	0.7	8
	<b>Mira</b> <sup>1,r</sup>	1.5	7	0.3	8	14.0	6	1.3	7
	<b>Paramount</b> <sup>r</sup>	6.3	6	1.6	6	8.3	6	7.3	5
	<b>RB 386 (Hunter)</b> <sup>1</sup>	0.3	8	3.5	5	0.0	9	78.0	1
	<b>Rembrandt</b> <sup>1</sup>	4.1	6	7.8	3	4.0	7	0.0	9
	<b>Robinta</b> <sup>r</sup>	6.8	6	4.2	5	18.6	5	28.3	2
	Sunset <sup>r</sup>	1.8	7	3.6	5	10.0	6	2.67	7

(C) Control varieties (S) Standard varieties %SA=percentage surface area covered <sup>r</sup> = red skinned variety <sup>1</sup> Based on 1 year's data

<sup>†</sup> Rating re-assessed for 2004-05

TABLE 6. AGRONOMIC ASSESSMENT MEANS AND RATINGS FOR WARE AND PROCESSING VARIETIES INCLUDED IN INDEPENDENT VARIETY TRIALS (2003-2005).

Use	Variety	Weight Loss (%)		Dry matter (%)	Fry Colour		
		%	Rating		Hunter Lab	Rating	
<b>Salad</b>	Charlotte (C)	7.5	3	18.0			
	Nicola (S)	8.0	5	17.7			
	Maris Peer (S)	3.4	6	19.0			
	Bernadette <sup>1</sup>	6.6	4	16.8			
	Gasore	7.6	3	19.6			
	86F 2.2	3.0	7	19.0			
<b>Second early/ Maincrop</b>	Estima (C)	3.8	6	18.3			
	Maris Piper (C)	3.7	5	20.7			
	<b>90-60-27</b>	4.3	4	15.1			
	<b>AD12 (Aldo)</b>	5.1	3	20.8			
	Axona <sup>1,r</sup>	3.9	5	21.6			
	Mira <sup>1,r</sup>	4.3	4	21.0			
	RB 386 (Hunter) <sup>1</sup>	5.3	3	18.5			
	Rembrandt <sup>1</sup>	4.3	4	20.7			
	<b>Maincrop</b>	Desiree (C)	3.1	6	21.0		
	<b>(red skin cvs)</b>	<b>93-01-02 (Nadia)<sup>1</sup></b>	4.4	5	18.2		
	<b>Paramount<sup>1</sup></b>	4.0	5	18.1			
	<b>Robinta<sup>1</sup></b>	4.1	5	20.5			
	Sunset <sup>1</sup>	4.5	5	17.5			
<b>Crisping</b>	Lady Rosetta (C)	5.5	6	23.7	56.6	6	
	Tay	6.3	6	22.7	59.2	6	

(C) Control varieties (S) Standard varieties %SA=percentage surface area covered <sup>1</sup> Based on 1 year's data



## Discussion

The overall objective of the storage assessment of the Independent Variety Trials is to find new varieties that out-perform established varieties in terms of storability. An indication of how well individual varieties are suited to long term storage is provided by looking at major traits of the relevant end-use group and, in particular, in relation to the control variety. The data presented in this report are designed to allow comparisons of qualities (such as disease levels, weight loss and fry colour) between established and new varieties after a 24 to 28 week period in store.

Of the maincrop ware varieties tested for blemish disease levels between 2003 and 2005, all of Axona, Mira, Paramount and Sunset compared favourably with the controls in all disease categories. Of all the varieties tested, no variety had a mean skin bloom, or shine, value of more than 4.0. Therefore, the skin finish obtained under the field and storage conditions imposed would generally be considered suitable for packing.

Other test varieties were more resistant to specific pathogens but not so good with others; four varieties, 90-60-27, Aldo, Hunter and Robinta, compared favourably against the control varieties in their ratings for silver scurf, black dot and skin spot. However, these test varieties were all rated highly susceptible to black scurf (rated 1 or 2). Nadia compared well with the control varieties in terms of resistance to black dot and silver scurf but had the highest levels of skin spot (after Desiree) of all varieties tested. Rembrandt showed good resistance to silver scurf, black scurf and skin spot but was fairly susceptible to black dot.

All maincrop ware varieties performed reasonably in terms of weight loss (each with ratings 4 to 6) except for Aldo and Hunter, which rated poorly (rating 3).

The salad varieties, Bernadette and Gasore, performed at least as well as the control variety, Charlotte, in terms of the blemish diseases, black dot, black scurf, silver scurf and skin spot. However, the after storage weight loss was high in Gasore. The variety 86F2.2 performed at least as well as Charlotte on all storage blemish diseases except black dot.

The only crisping variety tested, Tay, performed well against the control, Lady Rosetta, in terms of fry colour and weight loss. However, Tay had high incidences of spraing when grown at the Kincardineshire site (compared with that in the Maris Piper control). Tobacco rattle virus infection was confirmed by NIAB.

The IVT results should be considered as a guide to the suitability of varieties for storage. Nevertheless, as they are from small plot trials grown at two sites, the data should not be viewed in isolation but used together with industry experience of individual varieties.

## **Acknowledgements**

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## Appendix 1. Assessment methods

### *Dry matter*

The dry matter content of samples is determined by a method measuring weight in air and water. This method, like a hydrometer, estimates dry matter indirectly via specific gravity.

### *Fry colour (crisps)*

A sub-sample of thirty tubers is peeled and cut in half longitudinally with one half being discarded. From each remaining half-tuber 2-3 slices are removed, using a slicer, and discarded. A further 2-4 slices are removed and those with a slice thickness in the range 1.2 to 1.5 mm are retained until 300 g of slices is obtained with all tubers of the sample represented. The sample is washed for 45 seconds before being fried for 3 minutes in vegetable oil pre-heated to 177°C. Fry defects (greening, unacceptable fry colour and bruising) are removed before a crushed sample is assessed for fry colour using a Hunter Lab DP-9000. Results presented are the mean of three readings.

### *Disease measurement*

Surface blemish diseases are scored by estimation of the percentage surface area affected (within the categories, 0, 1, 1-5, 5-10, 10-25, 25-50, 50-100). Gangrene, dry rot, soft rots and other defects are assessed as the percentage of sample affected (i.e. incidence).

### *Bloom*

Tubers for bloom assessment were washed in a barrel washer (Peter Cox Marketing Ltd, UK) for 2 minutes and air-dried overnight. A hand-held device, the bloom-meter (developed for BPC by SAC), was used to measure the amount of specular light reflected off an area of skin under test (approximately 10mm<sup>2</sup> of flat surface). Integer values from 1 (bright, shiny skin) to 5 (dull, matt skin) were obtained. Care was taken to avoid areas that were affected by netting, eyes and obvious blemishes.

## Appendix 2. General quality and pathology assessments (means) for salad varieties (2003-2005)

Variety	Maturity	Site	Year	Weight loss %	Dry matter %	Silver scurf %SA	Black dot %SA	Skin spot % incidence	Black scurf % incidence	Bloom (1-5 score)
Charlotte	SE	Suffolk	2003-04	5.7	17.3	2.2	0.1	0.0	6.7	3.4
		Kincardineshire	2003-04	‡	‡	1.2	0.0	8.0	17.3	‡
		Suffolk	2004-05	6.3	20.3	0.6	0.0	1.3	61.3	3.0
		Kincardineshire	2004-05	5.6	16.5	7.7	12.1	0.0	30.7	3.6
Maris Peer	SE	Suffolk	2004-05	3.7	20.7	0.5	0.0	1.3	0.0	3.0
		Kincardineshire	2004-05	3.1	17.3	4.0	15.5	1.3	2.7	2.8
Nicola	SE	Suffolk	2003-04	4.4	15.9	0.4	0.0	2.7	24.0	3.8
		Kincardineshire	2003-04	‡	‡	0.0	0.0	20.0	4.0	‡
		Suffolk	2004-05	5.4	20.7	0.1	0.0	16.0	70.7	3.2
		Kincardineshire	2004-05	4.8	16.5	1.4	1.1	1.3	32.0	3.4
Bernadette	SE	Suffolk	2003-04	4.0	16.5	5.2	0.0	0.0	10.7	3.2
		Kincardineshire	2003-04	‡	‡	0.2	0.0	13.3	2.7	‡
		Suffolk	2004-05	5.6	18.3	2.6	0.0	0.0	0.0	3.1
		Kincardineshire	2004-	5.6	15.7	6.5	9.0	0.0	4.0	3.3

**Appendix 2 (continued). General quality and pathology assessments (means) for ware varieties (2003-2005)**

Variety	Maturity	Site	Year	Weight loss	Dry matter	Silver scurf	Black dot	Skin spot	Black scurf	Bloom
Gasore	SE	Suffolk	2004-05	7.4	22.5	0.3	0.0	1.3	98.7	3.6
		Kincardineshire	2004-05	7.8	16.6	1.4	7.2	0.0	26.7	4.0
86F 2.2	SE	Suffolk	2004-05	2.7	21.1	1.1	0.0	0.0	0.0	4.0
		Kincardineshire	2004-05	3.3	16.9	3.9	13.5	1.3	0.0	4.0
Maris Piper (C)	MC	Suffolk	2003-04	3.0	21.6	3.1	0.0	0.0	0.0	3.4
		Kincardineshire	2003-04	4.5	21.9	8.9	0.3	73.3	1.3	3.5
		Suffolk	2004-05	4.2	22.2	1.5	0.0	5.3	0.0	3.5
		Kincardineshire	2004-05	3.0	17.1	7.8	8.9	5.3	0.0	2.9
Desiree (C)	MC	Suffolk	2003-04	2.3	20.0	0.5	0.3	8.0	22.7	3.7
		Kincardineshire	2003-04	3.1	21.9	1.8	0.0	97.3	6.7	3.6
		Suffolk	2004-05	3.5	21.2	1.4	0.0	2.7	13.3	3.8
		Kincardineshire	2004-05	3.7	16.8	4.6	12.6	54.7	5.3	3.5

**Appendix 2 (continued). General quality and pathology assessments (means) for ware varieties (2003-2005)**

Variety	Maturity	Site	Year	Weight loss	Dry matter	Silver scurf	Black dot	Skin spot	Black scurf	Bloom
Estima	SE	Suffolk	2003-04	3.5	18.3	2.5	0.0	0.0	2.7	3.8
		Kincardineshire	2003-04	4.2	19.3	31.6	2.3	28.0	1.3	3.8
		Suffolk	2004-05	4.0	19.9	2.4	0.0	0.0	1.3	3.3
		Kincardineshire	2004-05	3.3	15.8	17.1	26.8	1.3	1.3	3.5
90-60-27		Suffolk	2003-04	3.8	15.7	1.4	0.0	0.0	98.7	3.4
		Kincardineshire	2003-04	5.4	15.8	10.8	0.2	22.7	73.3	3.8
		Suffolk	2004-05	4.7	15.8	1.3	0.1	0.0	77.3	3.2
		Kincardineshire	2004-05	3.4	13.3	8.0	6.2	2.7	48.0	3.4
93-01-02 (Nadia)		Suffolk	2003-04	3.6	18.1	1.6	0.0	36.0	5.3	4.1
		Kincardineshire	2003-04	5.9	18.6	1.6	0.4	53.3	0.0	3.7
		Suffolk	2004-05	4.8	19.9	1.7	0.0	4.0	52.0	4.0
		Kincardineshire	2004-05	3.5	16.1	2.7	8.5	46.7	4.0	3.9

**Appendix 2 (continued). General quality and pathology assessments (means) for ware varieties (2003-2005)**

Variety	Maturity	Site	Year	Weight loss	Dry matter	Silver scurf	Black dot	Skin spot	Black scurf	Bloom
AD12 (Aldo)		Suffolk	2003-04	4.7	20.4	1.3	0.0	2.7	88.0	3.9
		Kincardineshire	2003-04	4.4	22.5	2.9	0.1	89.3	13.3	3.7
		Suffolk	2004-05	6.5	23.0	2.1	0.0	0.0	0.0	3.8
		Kincardineshire	2004-05	4.9	17.5	5.8	13.4	12.0	0.0	3.9
Axona		Suffolk	2004-05	4.5	24.8	1.0	0.0	1.3	1.3	3.8
		Kincardineshire	2004-05	3.2	18.4	3.8	7.8	41.3	0.0	3.7
Mira		Suffolk	2004-05	4.5	23.2	0.5	0.0	2.7	0.0	3.3
		Kincardineshire	2004-05	4.1	18.9	2.5	0.6	25.3	2.7	3.1
Paramount		Suffolk	2003-04	3.2	18.4	1.1	0.0	0.0	12.0	4.1
		Kincardineshire	2003-04	4.2	19.3	17.9	0.1	32.0	2.7	4.0
		Suffolk	2004-05	4.5	19.5	1.1	0.0	0.0	14.7	4.0
		Kincardineshire	2004-05	4.3	15.3	5.3	6.4	1.3	0.0	4.0
RB386 (Hunter)		Suffolk	2004-05	6.1	19.9	0.2	0.0	0.0	97.3	3.9
		Kincardineshire	2004-05	4.5	17.0	0.4	7.0	0.0	58.7	3.7

**Appendix 2 (continued). General quality and pathology assessments (means) for ware varieties (2003-2005)**

Variety	Maturity	Site	Year	Weight loss	Dry matter	Silver scurf	Black dot	Skin spot	Black scurf	Bloom
Rembrandt		Suffolk	2003-04	5.2	20.7	†	†	†	†	†
		Kincardineshire	2003-04	4.6	21.6	†	†	†	†	†
		Suffolk	2004-05	4.7	22.5	1.8	0.0	1.3	0.0	3.0
		Kincardineshire	2004-05	3.9	18.1	6.5	15.9	6.7	0.0	3.6
Robinta		Suffolk	2003-04	3.3	20.7	1.1	0.1	1.3	34.7	4.0
		Kincardineshire	2003-04	4.9	22.4	14.8	0.0	65.3	9.3	4.0
		Suffolk	2004-05	4.7	20.6	1.5	0.0	5.3	66.7	3.9
		Kincardineshire	2004-05	3.5	18.1	9.8	16.7	2.7	2.7	3.8
Sunset		Suffolk	2003-04	2.7	16.5	0.9	0.0	0.0	8.0	3.9
		Kincardineshire	2003-04	5.7	19.8	2.0	0.1	33.3	2.7	3.9
		Suffolk	2004-05	5.5	19.6	0.7	0.0	5.3	0.0	4.0
		Kincardineshire	2004-05	4.0	14.2	3.8	14.1	1.3	0.0	4.0

† Rembrandt stored as processing variety in 2003-4 season

‡ Skins insufficiently set to enable realistic assessment



### Appendix 3 General quality assessments (means) for crisping varieties (2003-2005) after storage

Variety	Use	Site	Year	Weight loss %	Dry matter %	Fry colour Hunter L
Lady Rosetta	Crisping	Suffolk	2003-04	4.4	22.4	58.20
		Kincardineshire	2003-04	5.8	25.8	53.80
		Suffolk	2004-05	6.1	25.3	61.90
		Kincardineshire	2004-05	5.8	21.3	52.60
Tay	Crisping	Suffolk	2003-04	4.9	22.6	61.80
		Kincardineshire	2003-04	6.7	25.0	54.50
		Suffolk	2004-05	6.2	23.4	64.40
		Kincardineshire	2004-05	7.3	20.0	56.16

No French fry varieties were stored in 2004-05 season

## Appendix 4. Mean internal defects (% incidence) for crisping varieties after storage

Variety	Site	Year	Gangrene	Dry rot	Internal rust spot	Vascular discolouration	Internal browning	Hollow heart	Internal sprouting	Spraing
Lady Rosetta	Suffolk	2003-04	0.0	0.0	4.0	0.0	1.3	0.0	0.0	0.0
	Kincardineshire	2003-04	0.0	1.6	10.7	0.0	0.0	4.0	0.0	6.7 <sup>†</sup>
	Suffolk	2004-05	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
	Kincardineshire	2004-05	0.0	0.0	2.7	4.0	1.3	0.0	0.0	2.7 <sup>†</sup>
Tay	Suffolk	2003-04	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0
	Kincardineshire	2003-04	0.0	0.0	5.3	0.0	6.7	2.7	0.0	30.7 <sup>†</sup>
	Suffolk	2004-05	0.0	0.0	0.0	0.0	0.0	2.7	0.0	0.0
	Kincardineshire	2004-05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.3 <sup>†</sup>

<sup>†</sup> TRV diagnosis confirmed by NIAB