



## Research Project Report

# Independent Variety Trials

# 2008

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## **1. SUMMARY FOR GROWERS**

### ***1.1 Project Aims***

In order to comply with both national and European Community legislation for the marketing of seed potatoes, all potato varieties must be placed on the official National List (NL) of a Member State. When this is achieved, a variety is automatically entered on to the Common Catalogue which is, in effect, an EC National List. Part of the NL testing involves assessing a new variety for Value for Cultivation and Use. In the UK, this testing is largely concentrated on assessing varietal performance for susceptibility to diseases, pests and some tuber quality characteristics considered to be of most importance in UK potato production. After a review of the Independent Variety Trials (IVT) programme, industry, through the British Potato Council (BPC), concluded that additional tests for some other diseases were also desirable in order to provide growers with the fullest information on the performance of new varieties before large scale production occurred. In addition, industry also concluded that potato varieties on the Common Catalogue which were being developed for GB production should also to be tested to provide independent data on these varieties for GB growers. It was also decided that IVT tests would be conducted over 2 years and not 3 years as previously, and that industry alone would be responsible for conducting field growing trials to assess varietal performance with respect to yield and usage quality.

The integration of the IVT test programme with that of UK National List Value for Cultivation and Use test programme was achieved in 2005 by the consortium of Scottish Agricultural Science Agency (SASA), SAC Commercial Ltd (SAC), Biomathematics & Statistics for Scotland (BioSS) and Scottish Crop Research Institute (SCRI) which was awarded a 3 year contract to conduct the IVT programme. The tests conducted for IVT purposes were to determine varietal susceptibility to foliage late blight in the field, black dot, black scurf, silver scurf and skin spot. This contract was extended for a further 3 years starting in 2008 by Potato Council Ltd (PCL).

### ***1.2 Work Undertaken and Findings***

In 2008, tests were conducted on 11 varieties undergoing their 2<sup>nd</sup> year of UK NL testing, 6 varieties which had completed UK NL tests and 8 Common Catalogue

varieties (see Table 2). SASA conducted a test to determine susceptibility to foliage late blight at a site near Ayr which is operated in conjunction with SCRI. Pot tests for black dot and black scurf were conducted by SAC and tests for silver scurf and skin spot by SASA. The Common Catalogue varieties were also tested by SASA for susceptibility to tuber late blight, common scab, powdery scab, blackleg (*Pectobacterium atrosepticum*), dry rot (*Fusarium sulphureum* and *F. solani* var. *coeruleum*), potato cyst nematodes (pathotypes of *Globodera rostochiensis* and *G. pallida*), external damage (splitting) and internal damage (bruising). All tests were completed satisfactorily.

Susceptibility/resistance was rated on 1-9 scale. Tables 1a and b summarise the results for varieties being tested in 2008. Table 1a presents the final ratings for varieties completing the test programme. For varieties in the 1<sup>st</sup> year of IVT programme, Table 1b presents provisional ratings shown in italic font for one year's test results and final ratings from NL tests in bold.

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TABLE 1A. SUMMARY OF FINAL VARIETAL RATINGS (1=LOW, 9=HIGH) FOR RESISTANCE TO DISEASES, PESTS AND DEFECTS FOR VARIETIES COMPLETING IVT PROGRAMME BASED ON OVER YEARS ANALYSIS OF IVT 2005-2008 AND NL FROM 1981.

	Mozart	Toluca	Daisy	Richhill	Upmarket	Lulu	Charlemont	Excalibur
Maturity	EM	EM	M	M	EM	2E	EM	M
Foliage late blight (field)	5	8	4	5	5	5	4	5
Black dot	8	8	5	4	7	5	6	6
Black scurf	4	7	8	6	2	7	9	3
Silver scurf	6	5	3	5	7	5	5	6
Skin spot	8	5	1	7	7	4	8	3
Foliage late blight (lab)	nt	nt	nt	5	5	5	4	4
Tuber late blight	5	6	5	6	2	7	4	6
Blackleg- <i>Pectobacterium atrosepticum</i>	6	5	8	7	8	6	2	8
Powdery scab	5	6	6	5	6	7	5	7
Common scab	6	5	5	5	7	7	5	5
Dry rot – <i>Fusarium coeruleum</i>	5	6	6	6	6	5	6	6
Dry rot – <i>Fusarium sulphureum</i>	3	1	1	5	5	2	6	6
PCN Ro-1	8	2	9	9	9	9	8	9
PCN Pa 2/3	2	2	2	2	2	3	3	3
External damage	5	1	7	7	5	4	4	6
Internal damage	7	4	6	5	6	8	6	5

nt = not tested

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TABLE 1B. SUMMARY OF RATINGS (1=LOW, 9=HIGH) FOR RESISTANCE TO DISEASES, PESTS AND DEFECTS FOR POTATO VARIETIES COMPLETING ONE YEAR OF IVT PROGRAMME (PROVISIONAL RATINGS ARE SHOWN IN ITALICS, FINAL RATINGS ARE IN BOLD).

	Piccolo Star	Sylvanna	Lady Jo	Rudolph	Sofia	Blue Belle	Inca Bella (00.H.14.A3)	Umruca (00.Z.305.A2)	Tabata (00.Z.306.A5)	Casablanca (95C215-049)	Bonny (97C100-055)	Rubesse (96C212-001)	Kifli (95-20-1)	Sarpo Sirona (2000-30-220)	Blue Danube (80-2-7)	Sarpo Una (97-18-6)	Pink Gypsy (99C090-092)
Maturity	2E	EM	M	EM	2E	EM	2E	2E	2E	1E	M	EM	EM	EM	EM	2E	EM
Foliage late blight (field)	4	4	4	5	3	4	6	5	5	3	5	4	5	6	5	5	4
Black dot	9	6	6	6	6	4	7	6	4	4	6	6	9	7	6	5	8
Black scurf	7	8	6	8	6	7	9	6	8	8	7	8	9	8	9	9	8
Silver scurf	7	2	8	3	7	5	4	7	4	3	7	5	5	5	3	7	6
Skin spot	6	4	6	7	6	4	3	7	6	1	6	6	4	4	7	7	7
Foliage late blight (lab)	<b>nt</b>	<b>nt</b>	<b>nt</b>	<b>nt</b>	<b>nt</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>5</b>	<b>7</b>	<b>4</b>	<b>6</b>	<b>3</b>
Tuber late blight	3	4	6	4	3	3	4	5	4	2	5	2	5	4	4	5	4
Blackleg- <i>Pectobacterium atrosepticum</i>	9	8	1	3	3	3	6	6	7	7	6	5	7	3	7	5	6
Powdery scab	6	7	7	5	5	5	8	6	8	5	5	5	4	7	6	7	8
Common scab	7	7	6	1	2	4	7	6	6	6	5	5	4	4	3	5	7
Dry rot – <i>Fusarium coeruleum</i>	4	5	6	5	3	4	5	4	5	2	6	6	4	3	7	3	6
Dry rot – <i>Fusarium sulphureum</i>	5	8	5	2	1	1	1	3	4	3	4	9	2	1	1	5	4
PCN Ro-1	<b>8</b>	<b>9</b>	<b>9</b>	<b>2</b>	<b>9</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>8</b>	<b>9</b>	<b>9</b>	<b>9</b>	<b>3</b>	<b>9</b>	<b>2</b>	<b>6</b>
PCN Pa 2/3	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>4</b>
External damage	7	7	7	6	6	6	6	6	7	7	7	1	6	3	5	1	7
Internal damage	6	4	6	5	8	3	8	2	3	4	7	5	7	5	6	5	7

nt = not tested

### **1.3 Conclusions**

In summary, the main findings (Resistant = 7 or more; Susceptible = 3 or less) for the test varieties, with final ratings in bold were as follows:

#### **Mozart**

Resistant to: **black dot, skin spot, internal damage and PCN Ro1**

Susceptible to: **dry rot – *F. sulphureum* and PCN Pa 2/3 and 1**

#### **Toluca**

Resistant to: **foliage late blight, black scurf and black dot**

Susceptible to: **dry rot – *F. sulphureum*, external damage and PCN Ro1, Pa 2/3 and 1**

#### **Daisy**

Resistant to: **black scurf, blackleg, external damage and PCN Ro1**

Susceptible to: **silver scurf, skin spot, dry rot – *F. sulphureum* and PCN Pa2/3 and 1**

#### **Richhill**

Resistant to: **skin spot, blackleg, external damage and PCN Ro1**

Susceptible to: **PCN Pa2/3 and 1**

#### **Upmarket**

Resistant to: **black dot, silver scurf, skin spot, blackleg, common scab and PCN Ro1**

Susceptible to: **black scurf, tuber late blight and PCN Pa2/3 and 1**

#### **Lulu**

Resistant to: **black scurf, tuber late blight, powdery scab, common scab, internal damage and PCN Ro1**

Susceptible to: **dry rot – *F. sulphureum* and PCN Pa2/3 and 1**

#### **Charlemont**

Resistant to: **black scurf, skin spot and PCN Ro1**

Susceptible to: **blackleg and PCN Pa 2/3 and 1**



**Excalibur**

Resistant to: **blackleg, powdery scab** and **PCN Ro1**

Susceptible to: **skin spot, black scurf** and **PCN Pa2/3 and 1**

**Piccolo Star**

Resistant to: *black dot, black scurf, silver scurf, blackleg, common scab, external damage* and **PCN Ro1**

Susceptible to: *tuber late blight* and **PCN Pa 2/3 and 1**

**Sylvanna**

Resistant to: *black scurf, blackleg, powdery scab, common scab, dry rot – F. sulphureum, external damage* and **PCN Ro1**

Susceptible to: *silver scurf* and **PCN Pa 2/3 and 1**

**Lady Jo**

Resistant to: *silver scurf, powdery scab, external damage* and **PCN Ro1**

Susceptible to: *blackleg* and **PCN Pa 2/3 and 1**

**Rudolph**

Resistant to: *black scurf* and *skin spot*

Susceptible to: *silver scurf, blackleg, common scab, dry rot – F. sulphureum, PCN Ro1* and **PCN Pa 2/3 and 1**

**Sofia**

Resistant to: *silver scurf, internal damage* and **PCN Ro1**

Susceptible to: *foliage late blight, tuber late blight, blackleg, common scab, dry rot – F. coeruleum, dry rot – F. sulphureum* and **PCN Pa 2/3 and 1**

**Blue Belle**

Resistant to: *black scurf*

Susceptible to: *tuber late blight, blackleg, dry rot – F. sulphureum, internal damage, PCN Ro1* and **PCN Pa 2/3 and 1**

**Inca Bella (00.H.14.A3)**

Resistant to: *black dot*, *black scurf*, **powdery scab**, **common scab** and **internal damage**

Susceptible to: *skin spot*, **dry rot – *F. sulphureum***, **PCN Ro1** and **PCN Pa 2/3 and 1**

**Chincha (00.Z.305.A2)**

Resistant to: *silver scurf* and *skin spot*

Susceptible to: **dry rot – *F. sulphureum***, **internal damage**, **PCN Ro1** and **PCN Pa 2/3 and 1**

**Tabitha (00.Z.306.A5)**

Resistant to: *black scurf*, **blackleg**, **powdery scab** and **external damage**

Susceptible to: **internal damage** and **PCN Pa 2/3 and 1**

**Casablanca (95C215-049)**

Resistant to: *black scurf*, **blackleg**, **external damage** and **PCN Ro1**

Susceptible to: *skin spot*, *silver scurf*, *foliage late blight*, **tuber late blight**, **dry rot – *F. coeruleum***, **dry rot – *F. sulphureum***, and **PCN Pa 2/3 and 1**

**Bounty (96C166-055)**

Resistant to: *black scurf*, *silver scurf*, **external damage**, **internal damage** and **PCN Ro1**

Susceptible to: **PCN Pa 2/3 and 1**

**Rubesse (97C212-001)**

Resistant to: *black scurf*, **dry rot – *F. sulphureum*** and **PCN Ro1**

Susceptible to: **tuber late blight**, **external damage** and **PCN Pa 2/3 and 1**

**Kifli (95-20-1)**

Resistant to: *black dot*, *black scurf*, **blackleg**, **internal damage** and **PCN Ro1**

Susceptible to: **dry rot – *F. sulphureum*** and **PCN Pa 2/3 and 1**

**Sarpo Shona (2000-30-20)**

Resistant to: *black scurf*, *black dot* and **powdery scab**,

Susceptible to: **blackleg**, **dry rot – *F. coeruleum***, **dry rot – *F. sulphureum***, **external damage**, **PCN Ro1** and **PCN Pa 2/3 and 1**

**Blue Danube (80-2-7)**

Resistant to: *black scurf*, *skin spot*, **blackleg**, **dry rot** – *F. coeruleum* and **PCN Ro1**

Susceptible to: *silver scurf*, **common scab**, **dry rot** – *F. sulphureum* and **PCN Pa 2/3 and 1**

**Sarpo Una (97-18-6)**

Resistant to: *black scurf*, *silver scurf*, *skin spot* and **powdery scab**

Susceptible to: **dry rot** – *F. sulphureum*, **external damage**, **PCN Ro1** and **PCN Pa 2/3 and 1**

**Pink Gypsy (99C090-092)**

Resistant to: *black dot*, *black scurf*, *skin spot*, **powdery scab**, **common scab**, **external damage** and **internal damage`**

Susceptible to:

## **2. EXPERIMENTAL SECTION**

### **2.1 Introduction**

A review of the UK National List programme was concluded in 2004 and the various varietal characteristics were prioritised according to national importance and to industry. In consultation with industry stakeholders, it was also agreed that closer co-operation with IVT funded by BPC would be advantageous in minimising duplication of testing and in ensuring that the decision making process for the official listing of new varieties could utilise all available, good quality independent data such as that generated in IVT tests.

For National List purposes, the diseases and pests prioritised as being of national importance were foliage late blight, tuber late blight, blackleg (*Pectobacterium atrosepticum* syn. *Erwinia carotovora* var. *atroseptica*) and potato cyst nematodes (*Globodera rostochiensis* pathotype Ro1 and *Globodera pallida* pathotypes Pa2/3 and Pa1). The characters agreed as being of less significance nationally but important to industry were powdery scab, common scab, dry rot - *Fusarium solani* var. *coeruleum*, dry rot - *F.sulphureum*, potato virus Y<sup>o</sup>, potato leafroll virus, external damage (splitting) and internal damage (bruising). In addition, unreplicated assessments of tuber yield, and external and internal tuber defects were to be made in order to comply with the requirements of the EU Directive 72/180/EEC and 02/8/EC. The consultation also agreed that varieties entered for IVT testing could be incorporated into NL tests.

In 2005, a 3 year contract to conduct a revised IVT programme was awarded to a consortium of SASA, SAC, BioSS and SCRI. The tests to be conducted for IVT purposes were foliage late blight in the field (SASA), black scurf (SAC), black dot (SAC), silver scurf (SASA) and skin spot (SASA). In addition, SASA would test Common Catalogue varieties entered for IVT for all NL characters, except PVY and leafroll. Tests were to be conducted over 2 years instead of 3 years. The contract was extended for a further 3 years to cover the seasons 2008-2110. This report summarises the testing conducted over the 2008-2009 season.

## **2.2 Materials and Methods**

### **2.2.1. Standard Varieties**

The standard varieties used in 2007 were reviewed and retained for the 2008 test programme. The varieties used in each test are listed below with, in brackets, their foliage maturity and the susceptibility rating as published in NIAB Pocket Guide to Varieties of Potatoes, 2006 :

Foliage late blight:	Home Guard [1E, 4], Orla [1E, 8], Bintje [M, 2], Russet Burbank [M, 3], Stirling [M, 8], Cara [M, 6]
Black scurf:	Sante [M, 3], Duke of York [1E, 5], Saxon [2E, 5], King Edward [M, 6], Cara [M, 7], Lady Christl [1E, 8]
Black dot:	Lady Christl [1E, 2], Pentland Squire [M, 3], Fianna [M, 5] Cara [M, 6], Saxon [2E, 7]
Silver scurf:	Lady Christl [1E, 2], Pentland Squire [ M, 3], Romano [ 2E, 4], Fianna [ M, 5], Saxon [ 2E, 5], Cara [ M, 7]
Skin spot:	Pentland Squire [M, 2], King Edward [M, 3], Sante [M, 3], Saxon [2E, 6], Romano [2E, 7], Fianna [M, 8]

### **2.2.2 Varieties in Trial (Table 2)**

In line with the policy established by PCL, of the varieties submitted for UK National List Trials, only those varieties entering the 2<sup>nd</sup> year of testing or those that had completed NL testing were considered for entry to the IVT programme. In addition, 5 new Common Catalogue varieties were identified for inclusion in the test programme. As a plant health

precaution, all seed potatoes from non-UK sources were tested for brown rot (*Ralstonia solanacearum*) and ring rot (*Clavibacter michiganensis* subsp. *sepedonicus*) bacteria.

TABLE 2. VARIETIES IN IVT IN 2008

Variety	Breeder/Agent	Maturity	Stage of testing in 2008	
			NL	IVT
<u>UK National List</u>				
Excalibur	Cygnet PB	Maincrop	Completed	2
Lulu	Caithness	2nd Early	Completed	2
Upmarket	Caithness	E. Maincrop	Completed	2
Richhill	Paul Watts, NIHPBS	Maincrop	Completed	2
Charlemont	Paul Watts, NIHPBS	E. Maincrop	Completed	2
Blue Belle	Germicopa/ Branston	E. Maincrop	Completed	1
Inca Bella (00.H.14.A3)	SCRI/MRS Ltd	2nd Early	2	1
Chincha (00.Z.305.A2)	SCRI/MRS Ltd	2nd Early	2	1
Tabitha (00.Z.306.A5)	SCRI/MRS Ltd	2nd Early	2	1
Casablanca (95C215-049)	Cygnet PB	1st Early	2	1
Bounty (96C166-055)	Cygnet PB	Maincrop	2	1
Rubesse (97C212-001)	Cygnet PB	E. Maincrop	2	1
Kifli (95-20-1)	Sarvari Research Trust	E. Maincrop	2	1
Sarpo Shona (2000-30-220)	Sarvari Research Trust	E. Maincrop	2	1
Blue Danube (80-2-7)	Sarvari Research Trust	E. Maincrop	2	1
Sarpo Una (97-18-6)	Sarvari Research Trust	2nd Early	2	1
Pink Gypsy (99C090-092)	Cygnet PB	E. Maincrop	2	1
<u>Common Catalogue</u>				
Mozart	HZPC	E. Maincrop	-	2
Toluca	Agrico	E. Maincrop	-	2
Daisy	MBMG	Maincrop	-	2
Piccolo Star	Van Rijn/ Branston	2nd Early	-	1
Sylvanna	HZPC/Greenvale	E. Maincrop	-	1
Lady Jo	Meijer/Potato Innovations	Maincrop	-	1
Rudolph	Agrico	E. Maincrop	-	1
Sofia	Greenvale/Agrico	2nd Early	-	1

### **2.2.3 IVT Test Methods**

The test methods used were those agreed and set out in the standard protocols prepared for the 2008 programme. Details of the tests are provided below:

**2.2.3.1 Foliage late blight in the field, 2008:** At the end of 2007 field test at Ayr, an isolate was taken from a late blight lesion on a plant of the R5 differential. Testing at SASA determined that the isolate was virulent to R1, 2, 3, 4, 5, 6, 7, 10 and 11 and SCRI confirmed the isolate as being of 13\_A2 genotype. The isolate was maintained and used as the test isolate in 2008 in NL and IVT tests. The test tubers were planted in plots of 2 tubers at Dalrymple, by Ayr. The 2<sup>nd</sup> early/maincrop experiment was planted on 16 May. The 1<sup>st</sup> early experiment was planted on 10 June. The layout was a randomised block design with 4 replications, each of 2 tubers. Plants of King Edward, in small pots, infected by the 13\_A2 isolate of *P. infestans* were laid out along the adjacent rows of King Edward on 7 July. On 18, 22, 30 July and 4 August, the % foliage affected by late blight was assessed using the diagrammatic key of Cruickshank *et al.* (1982). The % Area Under the Disease Progress Curve (AUDPC) was calculated according to the formulae of Fry (1978), after applying the angular transformation to the percentage values on each date.

**2.2.3.2 Skin spot, 2008:** test tubers were dipped for 0.5 min in a suspension of spores and mycelia (Carnegie & Cameron, 1983) and planted in pots containing a 1:1 mix of Bulrush compost and John Innes No 2 compost on 30 April. Pots were placed outdoors in peat beds on 1 May and watered by drip irrigation into each pot. The layout was randomised block with 6 replications. The haulm was killed by applying diquat dibromide (Reglone) on 15 August at the half the manufacturer's recommended rate. The tubers were harvested into separate plastic boxes on 16 and 17 October and then stored at 5-8<sup>0</sup>C until the first week in February. The % surface area affected by skin spot was recorded in 5 categories and a surface infection index calculated (Boyd, 1957).

**2.2.3.3 Silver scurf, 2008:** test tubers were dipped for 0.5 min in a suspension of macerated spores and mycelia and planted in pots containing Bulrush compost. Pots were placed in a polytunnel on 16 April. The layout was a randomised block design with 6 replications. Haulms were allowed to senesce naturally. Tubers were harvested on 13 and 14 October into separate plastic boxes and incubated at 12-15<sup>0</sup>C and high humidity until silver scurf lesions had developed sufficiently on the susceptible standard varieties. In mid January, the % surface area affected by silver scurf on each tuber was assessed using 6 categories. A

mean silver scurf index was calculated for each plot by multiplying the number of tubers in each category by the mid-point value and dividing the sum of these values by the total number of tubers assessed.

2.2.3.4        **Black dot, 2008:** Petri dishes containing potato dextrose agar (PDA) were inoculated with three isolates of *C. coccodes*. When the colonies had reached the edge of the dishes, the cultures were macerated using a liquidiser. The suspension was added to Bulrush compost at the rate of 1 Petri dish of *C. coccodes* per 8 kg compost in a cement mixer and mixed for 10 minutes. Test tubers were planted on 23 May in 25 cm diameter pots filled with amended compost which were set in individual watering saucers and then placed in a polytunnel in a randomised block design with 6 replications. Pots were watered every 2 days so that the compost was kept damp but not over-watered. Haulms were allowed to senesce naturally. Tubers were harvested on 23 October, after symptoms of black dot had been seen on the daughter tubers of the susceptible reference varieties. The tubers were placed into paper bags and kept over night in a cold store. The % surface area affected by black dot was then assessed on the 3 November.

2.2.3.5        **Black scurf, 2008:** Petri dishes containing PDA were inoculated with three isolates of *R. solani* AG-3. When the colonies had reached the edge of the agar plate, the cultures were macerated in a liquidiser and added to compost in a cement mixer at a rate of 1 dish per 8 kg of Bulrush compost. On 21 May, a single seed tuber of each variety was planted in a 25 cm diameter pot which was placed in an individual watering saucer. Pots were laid out in a polytunnel in a randomised block design with 6 replicates. Plants were grown and maintained as in Section 2.2.3.4. All daughter tubers from each pot were harvested on 17 October, after symptoms of black scurf were seen on the susceptible reference varieties. The tubers were placed into paper bags and kept in a cold store. The % surface area covered by black scurf was assessed on 30 November.

#### 2.2.4 NL Tests

These were conducted on Common Catalogue varieties in accordance with the document “United Kingdom National List Trials: Trials Procedures for the Official Examination of value for Cultivation and Use (VCU) – Potato 2008”. The methods are summarised below:

**Tuber late blight:** the rose-end of field-grown tubers is sprayed with the 13\_A2 isolate of *P. infestans*. The number of tubers affected by late blight is counted after 10-14 days incubation.

**Common Scab:** test tubers are planted in pots in artificially infested compost kept dry during tuber initiation. Severity of common scab is assessed on daughter tubers.

**Powdery scab:** test tubers are planted in compost infected with scab peelings and kept wet during tuber initiation. Severity of powdery scab is assessed on daughter tubers.

**Blackleg:** test tubers are inoculated at the heel end with *Pectobacterium atrosepticum* and planted in an irrigated field trial. Incidence of blackleg is assessed 3 times during the growing season.

**Dry rot (separate test for *Fusarium solani* var. *coeruleum* and *F.sulphureum*):** test tubers are wounded and inoculated with a suspension of spores and incubated at 12-15<sup>0</sup>C. The degree of internal rotting is assessed.

**Potato Cyst Nematode (*Globodera* spp.):** tubers are planted in pots in compost infected with a standard concentration of PCN eggs. Cyst multiplication on roots is assessed.

**Damage, external (splitting) and internal (bruising):** a standard force is applied to the heel end of field grown tubers. Tubers for the splitting test are stored at 4-6<sup>0</sup>C and the incidence of splitting at the point of impact is recorded. Tubers for the bruising test are stored at 9-11<sup>0</sup>C and the depth of damage at point of impact measured.

#### **2.2.5. Statistical analysis**

Most of the data was recorded as percentages and was angularly transformed before conducting an individual trial analysis of variance. For PCN, log transformations were used. Over-year trial means were calculated using REML from transformed trial means; for IVT the test years from 2005 (the year when the consortium took over the trialling) were used, giving four years for this report, and for NL tests, all years from 1981 were used where data was available. This data was used to calculate the provisional and final ratings presented in Tables 1a and 1b. However, in the individual test reports, ratings presented are based on the analysis for 2 years only and have been presented to one decimal point to provide greater clarity. All ratings of 1-9 were derived by linear transformation (or according to a multiplication index for PCN) using varieties with known consistent susceptible and resistant reactions as fixed reference points.



## 2.3 Results

Neither ring rot nor brown rot bacteria were found in tested seed potatoes.

### 2.3.1 IVT Tests

#### 2.3.1.1 **Foliage late blight (field)**

##### 2.3.1.1.1 Summary of 2007/08 Trials (Table 3)

The AUDPC values on the reference varieties were slightly less in 2008 than in 2007. However, the epidemic proceeded more rapidly. Late blight was recorded on some varieties at a very low severity on 18 July and little further development of the disease had occurred by 22 July. However, by 30 July, late blight on susceptible varieties had progressed from <10% to >90% despite the absence of significant rainfall as evidenced by dry soil conditions. The only rainfall occurred on 25 July and was less than 4 mm. This was followed by 3 overnight periods when the relative humidity was above 90% suggesting that evening mists may have developed during these periods. These conditions would not normally be considered particularly favourable for infection by *P. infestans* but it may be that the 13\_A2 genotype can infect in less favourable environmental conditions than “older” genotypes.

All the varieties in the 1<sup>st</sup> Early trial including the resistant control, Orla, proved to be susceptible to foliar late blight. In the 2<sup>nd</sup> Early/Maincrop trial, Stirling was only moderately susceptible when challenged in 2008 by 13\_A2 isolate reflecting the changed reaction seen in 2007 when this isolate infiltrated the test in 2007. Although Stirling and Cara reacted similarly in 2006, Stirling was more susceptible than Cara in 2007 and a similar difference was seen in 2008. Of the varieties completing 2 years of IVT testing, Toluca was more resistant than Cara. The lesions which developed on plants of Toluca were hypersensitive, largely as a response to the high amount of spores being deposited on their leaves from adjacent susceptible plants. This resulted in a relatively high amount of necrotic tissue developing on plants of Toluca which would probably not have occurred in practice. Mozart, Excalibur, Lulu, Upmarket and Richhill also showed some evidence of a degree of useful resistance.

##### 2.3.1.1.2 2008 Trial (Table 3)

Sarpo Shona was the most resistant of the first year varieties scoring a provisional 6.0 followed by Inca Bella (00.H.14.A3), a Mayan Gold cross, scoring 5.7. None of the Common Catalogue varieties showed meaningful resistance with Sofia being most susceptible with a score of 2.8. Most of the other UK National list candidates scored between 3.5 and 4.5.

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TABLE 3. MEAN % (ANGULAR TRANSFORMATION) AREA UNDER DISEASE PROGRESS IN FOLIAGE LATE BLIGHT FIELD TEST FOR 1<sup>ST</sup> EARLY, 2<sup>ND</sup> EARLY AND MAINCROP VARIETIES IN 2007 AND 2008 (TWO YEAR RATING IN BOLD).

Variety	Test Year		1-9 rating
	2007	2008	
<b>1<sup>st</sup> Early</b>			
Home Guard	-	31.9	3.0
Orla	-	36.9	2.0
Casablanca (95C215-049)	-	37.3	2.0
LSD (P=0.05)		5.4	
<b>2<sup>nd</sup> Early/Maincrop</b>			
Bintje	68.9	50.3	<b>3.0</b>
Russet Burbank	60.2	48.9	<b>3.5</b>
Cara	36.1	24.9	<b>6.0</b>
Stirling	48.7	40.7	<b>4.5</b>
Mozart	47.7	36.6	<b>4.8</b>
Toluca	18.3	14.5	<b>7.5</b>
Daisy	58.2	45.6	<b>3.8</b>
Piccolo Star	-	42.6	3.9
Sylvanna	-	42.6	3.9
Lady Jo	-	41.6	4.0
Rudolph	-	36.4	4.6
Sofia	-	52.4	2.8
Blue Belle		41.3	4.1
Excalibur	53.4	32.4	<b>4.7</b>
Lulu	51.8	35.9	<b>4.6</b>
Upmarket	50.8	29.0	<b>5.0</b>
Richhill	42.6	33.5	<b>5.2</b>
Charlemont	52.7	45.5	<b>4.1</b>
Inca Bella (00.H.14.A3)	-	27.5	5.7
Chincha (00.Z.305.A2)	-	39.5	4.3
Tabitha (00.Z.306.A5)	-	38.7	4.4
Bounty (96C166-055)	-	32.2	5.1
Rubesse (97C212-001)	-	43.0	3.9
Kifli (95-20-1)	-	39.3	4.3
Sarpo Shona (2000-30-220)	-	25.3	6.0

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TABLE 3 (CONTD)

Blue Danube (80-2-7)	-	34.1	4.9
Sarpo Una (97-18-6)	-	36.2	4.7
Pink Gypsy (99C090-092)	-	45.4	3.6
LSD (P=0.05)	9.8	5.4	

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2.3.1.2. **Black scurf**2.3.1.2.1 Summary of 2007/2008 Trials (Table 4)

In general, the severity of black scurf on reference varieties was similar or slightly less in 2008 to that in 2007 except for var. Sante on which it was greater. The severity ranged from 3.1 to 18.6 in 2008 compared with 9.2 to 19.4 in 2007. The most resistant variety was Charlemont scoring 8.7, followed by Daisy with 7.6. Upmarket and Excalibur were the most susceptible of the candidate varieties scoring 2.6 and 3.8 respectively.

TABLE 4. MEAN % (ANGULAR TRANSFORMATION) SURFACE AREA AFFECTED BY BLACK SCURF

Variety	Test Year		1-9 rating
	2007	2008	
Sante (3)*	13.7	18.6	<b>2.8</b>
Duke of York (5)	13.9	14.0	<b>4.9</b>
Saxon (5)	13.4	14.0	<b>5.2</b>
King Edward (6)	13.8	10.2	<b>6.8</b>
Cara (7)	14.8	11.0	<b>6.0</b>
Lady Christ (8)	12.5	11.1	<b>7.0</b>
Mozart	14.2	13.8	<b>4.9</b>
Toluca	12.6	11.0	<b>7.0</b>
Daisy	12.2	10.1	<b>7.6</b>
Piccolo Star	-	11.1	7.0
Sylvanna	-	10.2	7.5
Lady Jo	-	12.0	6.5
Rudolph	-	10.2	7.5
Sofia	-	12.0	6.5
Blue Belle	-	10.9	7.1
Excalibur	14.7	15.6	<b>3.8</b>
Lulu	10.2	14.0	<b>6.7</b>
Upmarket	19.4	13.4	<b>2.6</b>
Richhill	12.6	12.6	<b>6.2</b>
Charlemont	10.4	9.6	<b>8.7</b>
Inca Bella (00.H.14.A3)	-	8.8	8.3
Chincha (00.Z.305.A2)	-	11.9	6.5
Tabitha (00.Z.306.A5)	-	10.4	7.4
Casablanca (95C215-049)	-	10.5	7.3
Bounty (96C166-055)	-	11.3	6.9
Rubesse (97C212-001)	-	10.5	7.4
Kifli (95-20-1)	-	9.5	7.9

TABLE 4 (CONTD)

Sarpo Shona (2000-30-220)	-	10.5	7.4
Blue Danube (80-2-7)	-	3.1	9.0
Sarpo Una (97-18-6)	-	8.5	8.5
Pink Gypsy (99C090-092)	-	10.8	7.2
LSD (P=0.05)	3.7	3.3	<b>4.1</b>

\* rating as published in NIAB Pocket Guide of Varieties of potato, 2006

#### 2.3.1.2.2 2008 Trial (Table 4)

All of the 1<sup>st</sup> year varieties showed resistance to black scurf with Blue Danube, Sarpo Una and Inca Bella being most resistant, scoring 9, 8.5 and 8.3 respectively.

2.3.1.3. **Black dot**

2.3.1.3.1 Summary of 2007/2008 Trials (Table 5)

In general, disease severity on the control varieties was less in 2008 than in 2007. Four varieties showed resistance at least as strong as the most resistant control, Saxon. Mozart was most resistant test variety scoring 7.9, with Toluca next scoring 7.1 and Upmarket and Excalibur scoring 6.2. The most susceptible test variety was Richhill scoring 3.9.

2.3.1.3.2 2008 Test (Table 5)

Most of the 1<sup>st</sup> year varieties showed some resistance to black dot with Piccolo Star, Kifli and Pink Gypsy (99C090-092) being best, scoring 9, 8.5 and 7.7 respectively. Blue Belle and Casablanca were most susceptible scoring 3.6 and 3.9 respectively.

TABLE 5. MEAN % (ANGULAR TRANSFORMATION) SURFACE AREA AFFECTED BY BLACK DOT

Variety	Test Year		
	2007	2008	1-9 rating
Lady Christl (2) <sup>*</sup>	43.5	36.1	<b>5.0</b>
Pentland Squire (3)	55.5	46.5	<b>3.0</b>
Fianna (5)	45.9	34.7	<b>5.0</b>
Cara (6)	41.8	33.8	<b>5.4</b>
Saxon (7)	36.6	32.4	<b>6.0</b>
Mozart	20.2	28.5	<b>7.9</b>
Toluca	30.5	26.8	<b>7.1</b>
Daisy	41.3	39.3	<b>4.9</b>
Piccolo Star	-	9.9	9.0
Sylvanna	-	33.2	5.8
Lady Jo	-	35.5	5.3
Rudolph	-	31.3	6.2
Sofia	-	33.8	5.7
Blue Belle	-	43.5	3.6
Excalibur	34.6	32.8	<b>6.2</b>
Lulu	43.6	36.5	<b>5.0</b>
Upmarket	36.6	29.7	<b>6.2</b>
Richhill	41.5	50.3	<b>3.9</b>

TABLE 5 (CONTD)

Charlemont	34.9	34.5	<b>6.0</b>
Inca Bella (00.H.14.A3)	-	30.1	6.5
Chincha (00.Z.305.A2)	-	33.6	5.7
Tabitha (00.Z.306.A5)	-	41.7	4.0
Casablanca (95C215-049)	-	42.2	3.9
Bounty (96C166-055)	-	31.4	6.2
Rubesse (97C212-001)	-	32.9	5.9
Kifli (95-20-1)	-	20.6	8.5
Sarpo Shona (2000-30-220)	-	26.4	7.3
Blue Danube (80-2-7)	-	31.7	6.2
Sarpo Una (97-18-6)	-	39.9	4.4
Pink Gypsy (99C090-092)	-	24.3	7.7
LSD (P=0.05)	11.5	10.6	<b>1.7</b>

\*rating of the variety as published in NIAB Pocket Guide to Varieties of Potatoes, 2006

2.3.1.4. **Silver scurf**2.3.1.4.1 Summary of 2007/2008 Trials (Table 6)

Apart from Pentland Squire, the ratings for the reference varieties were in reasonable agreement with published ratings. The severity of silver scurf on Pentland Squire tubers was relatively low in both years. The most resistant candidate variety was Upmarket scoring 6.7 and the most susceptible variety was Daisy scoring 2.9 although it was much less susceptible in 2008 than in 2007. The remaining candidate varieties were moderately resistant scoring between 5.1 and 5.8.

TABLE 6. MEAN % (ANGULAR TRANSFORMATION) SURFACE ARE AFFECTED BY SILVER SCURF

Variety	Test Year		1-9 rating
	2007	2008	
Lady Christl (2)*	23.5	36.2	<b>2.0</b>
Pentland Squire (3)	10.7	19.7	<b>6.3</b>
Romano (4)	11.8	23.0	<b>5.6</b>
Fianna (5)	19.0	20.5	<b>4.9</b>
Saxon (5)	12.5	19.6	<b>6.0</b>
Cara (7)	10.7	14.7	<b>7.0</b>
Mozart	10.5	23.2	<b>5.8</b>
Toluca	16.6	21.9	<b>5.1</b>
Daisy	32.7	20.5	<b>2.9</b>
Piccolo Star	-	14.9	6.9
Sylvanna	-	30.8	3.3
Lady Jo	-	10.8	7.9
Rudolph	-	29.0	3.7
Sofia	-	16.1	6.7
Blue Belle	-	22.2	5.3
Excalibur	14.2	16.8	<b>6.2</b>
Lulu	18.5	19.0	<b>5.2</b>
Upmarket	12.8	14.4	<b>6.7</b>
Richhill	16.0	21.7	<b>5.2</b>
Charlemont	15.3	19.9	<b>5.6</b>
Inca Bella (00.H.14.A3)	-	26.6	4.2
Chincha (00.Z.305.A2)	-	15.1	6.9



TABLE 6 (CONTD)

Tabitha (00.Z.306.A5)	-	24.2	4.8
Casablanca (95C215-049)	-	27.9	3.9
Bounty (96C166-055)	-	15.6	6.8
Rubesse (97C212-001)	-	21.9	5.3
Kifli (95-20-1)	-	21.5	5.4
Sarpo Shona (2000-30-220)	-	20.0	5.8
Blue Danube (80-2-7)	-	27.8	4.0
Sarpo Una (97-18-6)	-	16.1	6.7
Pink Gypsy (99C090-092)	-	19.2	6.0
LSD (P=0.05)	7.4	9.4	<b>2.8</b>

\*rating of the variety as published in NIAB Pocket Guide to Varieties of Potatoes, 2006

#### 2.3.1.4.2 2008 test (Table 6)

The severity of silver scurf was generally slightly greater in 2008 than in 2007. The mean severity scores ranged from 10.5 to 32.7 in 2007 compared with 10.8 to 36.2 in 2008. Of the varieties in the 1<sup>st</sup> year of testing, Lady Jo appeared to be more resistant than Cara scoring 7.9. Piccolo Star, Sofia, Chincha (00.Z.305.A2), Bounty and Sarpo Una also showed good resistance scoring between 6.7 and 6.9. Sylvanna and Rudolph were most susceptible varieties scoring 3.3 and 3.7 respectively.

2.3.1.5. **Skin spot**

2.3.1.5.1 Summary of 2007/2008 Trials (Table 7)

The severity of skin spot was much less in 2008 than in 2007 and this was reflected in a smaller least significant difference. Most of the varieties completing IVT testing were moderately or very resistant to skin spot with Mozart and Charlemont, each scoring 7.9. Daisy was the most susceptible variety, scoring 2.7.

2.3.1.5.2 2008 Test (Table 7)

Of the 1<sup>st</sup> year candidate varieties, Casablanca and Inca Bella appeared to be susceptible to skin spot, reacting similarly to Pentland Squire and King Edward. Chinchu (00.Z.305.A2), Blue Danube, Sarpo Una and Pink Gypsy (99C090-092) appeared to be very resistant to skin spot, each scoring 9. Tabitha (00.Z.306.A5), Rudolph and Lady Jo all scored 8.0 or more.

TABLE 7. MEAN % (ANGULAR TRANSFORMATION) SURFACE AREA AFFECTED BY SKIN SPOT.

Variety	Test Year		1-9 rating
	2007	2008	
Pentland Squire (2)*	27.2	8.9	<b>2.0</b>
King Edward (3)	23.4	6.2	<b>3.2</b>
Sante (3)	13.0	7.5	<b>5.0</b>
Saxon (6)	8.3	7.5	<b>5.8</b>
Romano (7)	6.6	3.1	<b>7.0</b>
Fianna (8)	6.2	0.8	<b>7.5</b>
Mozart	3.9	0.9	<b>7.9</b>
Toluca	9.0	6.0	<b>6.0</b>
Daisy	26.2	6.0	<b>2.7</b>
Piccolo Star	-	2.3	7.7
Sylvanna	-	6.0	4.5
Lady Jo	-	1.5	8.4
Rudolph	-	1.1	8.7
Sofia	-	2.4	7.6
Blue Belle	-	5.1	5.3
Excalibur	15.2	6.8	<b>4.7</b>

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TABLE 7 (CONTD)

Lulu	14.7	5.6	<b>5.0</b>
Upmarket	7.2	1.8	<b>7.1</b>
Richhill	5.7	0.6	<b>7.6</b>
Charlemont	4.8	0	<b>7.9</b>
Inca Bella (00.H.14.A3)	-	8.2	2.6
Chincha (00.Z.305.A2)	-	0.4	9.0
Tabitha (00.Z.306.A5)	-	1.9	8.0
Casablanca (95C215-049)	-	11.5	1.0
Bounty (96C166-055)	-	2.3	7.7
Rubesse (97C212-001)	-	2.7	7.4
Kifli (95-20-1)	-	5.5	5.0
Sarpo Shona (2000-30-220)	-	6.5	4.1
Blue Danube (80-2-7)	-	0	9.0
Sarpo Una (97-18-6)	-	0.3	9.0
Pink Gypsy (99C090-092)	-	0.6	9.0
LSD (P=0.05)	7.2	3.7	<b>3.6</b>

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\* rating of the variety as published in NIAB Pocket Guide to Varieties of Potatoes, 2006

**2.3.2. NL Tests****2.3.2.1 Tuber late blight (Table 8)**

A separate test for 1<sup>st</sup> Early varieties was not required because there were no candidates for this maturity category. The 2007 results for Stirling, Daisy and Mozart were not included in the over years analysis because the reactions in the 2 years differed considerably. Of the candidate Common Catalogue varieties completing IVT testing, Mozart and Daisy were most susceptible, scoring 4.3. Toluca was fairly resistant scoring 5.7 although, oddly, it was more resistant in 2008, relative to Bintje, when challenged by 13\_A2 isolate than in 2007 when tested using an old genotype. Of the 1<sup>st</sup> year varieties, all except Lady Jo (5.3) were very susceptible.

TABLE 8. MEAN % (ANGULAR TRANSFORMATION) TUBERS AFFECTED BY LATE BLIGHT

Variety	Test Year		
	2007	2008	1-9 rating
Bintje	69.4	90	<b>2.0</b>
Cara	-	55.9	<b>6.0</b>
Stirling	D	86.6	<b>2.7</b>
Mozart	D	72.0	<b>4.3</b>
Toluca	44.6	46.4	<b>5.7</b>
Daisy	D	71.8	<b>4.3</b>
Piccolo Star	-	90	2.0
Sylvanna	-	87.1	2.3
Lady Jo	-	62.3	5.3
Rudolph	-	87.0	2.4
Sofia	-	90	2.0
LSD (P=0.05)	21.3	13.1	<b>4.1</b>

D = result discarded because it was not consistent with result in 2008 using 13\_A2 isolate.

- = not tested

2.3.2.2 **Blackleg** (*Pectobacterium atrosepticum*) (Table 9)

The incidence of plants affected by blackleg was greater on the susceptible control varieties in 2008 with the exception of Concurrent. However, there was a clear difference between the susceptible and resistant reference varieties. Of the varieties completing testing, Daisy was as resistant as Ailsa while Mozart and Toluca were moderately resistant, each scoring 5.8. After 1 year of testing, Piccolo Star and Sylvanna appeared to be very resistant and Lady Jo, Rudolph and Sofia appeared to be very susceptible.

TABLE 9. MEAN % (ANGULAR TRANSFORMATION) PLANTS AFFECTED BY BLACKLEG (*PECTOBACTERIUM ATROSEPTICUM*)

Variety	Test Year		
	2007	2008	1-9 rating
Concurrent	42.1	31.7	<b>3.0</b>
Estima	26.3	32.5	<b>4.5</b>
Morene	32.5	57.5	<b>3.9</b>
Cultra	19.6	19.6	<b>6.8</b>
Ailsa	0	0	<b>8.0</b>
Mozart	20.5	27.1	<b>5.8</b>
Toluca	15.9	32.3	<b>5.8</b>
Daisy	0	9.2	<b>8.0</b>
Piccolo Star	-	0	9.0
Sylvanna	-	9.2	8.3
Lady Jo	-	68.9	1.0
Rudolph	-	49.4	2.5
Sofia	-	48.7	2.6
LSD (P=0.05)	16.5	18.1	<b>2.4</b>

- = not tested

2.3.2.3 **Common Scab** (Table 10)

The severity of common scab was much greater in 2008 than in 2007 and this was reflected in a greater LSD value. The most susceptible of the reference varieties was Maris Piper rated as 2.0. However, Desiree was much more susceptible in 2008 than in 2007. Of the varieties completing testing, Mozart was as resistant as Pentland Crown. Daisy was moderately resistant with a score of 5.0. Of the varieties in 1<sup>st</sup> year of testing, Sylvanna and Piccolo Star were more resistant than Pentland Crown while Rudolph and Sofia appeared to be very susceptible.

TABLE 10. MEAN % (ANGULAR TRANSFORMATION) SURFACE AREA AFFECTED BY COMMON SCAB

Variety	Test Year		
	2007	2008	1-9 rating
Maris Peer	5.8	18.6	<b>5.4</b>
Estima	4.5	16.1	<b>5.7</b>
Maris Bard	7.1	19.5	<b>4.0</b>
Home Guard	4.8	12.1	<b>4.6</b>
Maris Piper	17.2	20.7	<b>2.0</b>
Desiree	9.5	27.8	<b>2.4</b>
Pentland Crown	3.1	14.2	<b>7.0</b>
Mozart	2.4	10.3	<b>6.5</b>
Toluca	7.8	17.3	<b>4.3</b>
Daisy	6.6	14.5	<b>5.0</b>
Piccolo Star	-	10.0	7.7
Sylvanna	-	9.5	8.0
Lady Jo	-	13.1	6.4
Rudolph	-	30.1	1.0
Sofia	-	25.7	1.0
LSD (P=0.05)	4.9	7.9	<b>3.0</b>

2.3.2.4 **Powdery Scab** (Table 11)

Overall, the severity of powdery scab was broadly similar in both years. Estima continued to be clearly more susceptible than any of the other varieties. Accent's reaction in 2007 and 2008 was close to the rating of 6 in NIAB Pocket Guide to Varieties of Potatoes. None of the candidate varieties showed susceptibility to powdery scab with Toluca and Daisy being the most resistant of the three completing testing. Sylvanna was most resistant of 1<sup>st</sup> year candidates. However, Mozart and Sofia showed some susceptibility to cankerous powder scab in 2008 (data not shown).

TABLE 11. MEAN % (ANGULAR TRANSFORMATION) SURFACE AREA AFFECTED BY POWDERY SCAB

Variety	Test Year		1-9 rating
	2007	2008	
Accent	27.4	13.4	<b>6.7</b>
Estima	46.4	37.9	<b>3.0</b>
Cara	18.4	14.6	<b>7.2</b>
Pentland Crown	12.9	14.6	<b>7.7</b>
Sante	14.1	10.0	<b>8.0</b>
Mozart	27.8	22.9	<b>5.7</b>
Toluca	25.0	14.6	<b>6.7</b>
Daisy	27.1	13.5	<b>6.6</b>
Piccolo Star	-	15.0	7.1
Sylvanna	-	8.4	8.3
Lady Jo	-	11.7	7.7
Rudolph	-	21.5	5.9
Sofia	-	23.6	5.6
LSD (P=0.05)	7.6	5.1	<b>1.9</b>

2.3.2.5 **Dry rot** (*Fusarium* spp.)2.3.2.5.1 *F. solani* var. *coeruleum* (Table 12)

The number of successful infections and hence the amount of internal rotting were broadly similar in 2007 and in 2008. The susceptibilities of Catriona and Pentland Squire were in agreement with known reactions. Estima appeared to be less susceptible in 2008 than that in 2007. Sante was the most resistant of the reference varieties, reacting consistently over the 2 years. All of the varieties completing testing showed good resistance scoring 6.4 or better. While Sofia and Piccolo Star showed some susceptibility to *F. coeruleum* dry rot, the other three 1<sup>st</sup> year varieties showed strong resistance.

TABLE 12. MEAN % (ANGULAR TRANSFORMATION) INTERNAL AREA AFFECTED BY *FUSARIUM COERULEUM*

Variety	Test Year		1-9 rating
	2007	2008	
Pentland Squire	37.6	32.1	<b>3.0</b>
Catriona	44.6	40.4	<b>1.0</b>
Estima	27.1	17.4	<b>5.8</b>
Nadine	28.5	15.6	<b>5.4</b>
Sante	4.5	7.2	<b>8.0</b>
Mozart	17.0	15.7	<b>6.4</b>
Toluca	14.7	7.3	<b>7.4</b>
Daisy	8.2	14.3	<b>7.3</b>
Piccolo Star	-	26.2	4.2
Sylvanna	-	12.5	6.9
Lady Jo	-	8.0	7.8
Rudolph	-	11.7	7.1
Sofia	-	30.6	3.3
LSD (P=0.05)	8.9	5.7	<b>2.2</b>



2.3.2.5.2 *F. sulphureum* (Table 13)

The severity of rotting was generally less in 2008 than in 2007 except for var. Maris Piper. The reaction of var. Saxon varied considerably between the two years, being very susceptible in 2007 and resistant in 2008. Mozart, Toluca and Daisy were all very susceptible as were Rudolph and Sofia of the 1<sup>st</sup> year varieties. Sylvanna appeared to be very resistant to *F. sulphureum*.

TABLE 13. MEAN % (ANGULAR TRANSFORMATION) INTERNAL AREA AFFECTED BY *FUSARIUM SULPHUREUM*

Variety	Test Year		
	2007	2008	1-9 rating
Maris Piper	31.0	30.1	<b>3.0</b>
Atlantic	31.2	24.3	<b>4.4</b>
Nadine	34.3	22.6	<b>4.1</b>
Saxon	40.0	11.1	<b>4.7</b>
Sante	5.2	11.3	<b>8.0</b>
Mozart	41.1	35.4	<b>2.4</b>
Toluca	52.9	38.7	<b>1.0</b>
Daisy	61.0	43.1	<b>1.0</b>
Piccolo Star	-	24.6	4.4
Sylvanna	-	8.9	8.6
Lady Jo	-	22.6	5.0
Rudolph	-	35.4	1.6
Sofia	-	46.3	1.0
LSD (P=0.05)	8.4	6.7	<b>3.3</b>

2.3.2.6 **External Damage (splitting) (Table 14)**

The incidence of splitting was greater in 2008 than in 2007. Ulster Sceptre (3.0) was the most susceptible of the 1<sup>st</sup> early varieties and Russet Burbank (3.2) was the most susceptible of the maincrop varieties. The relative reaction of Red Craigs Royal over the two years was in line with its known performance. Of the varieties completing 2<sup>nd</sup> year testing, Daisy showed strong resistance to external damage scoring 7.0 which was an improvement over the resistant maincrop controls, Maris Piper and Record. By contrast, Toluca appeared to be very susceptible to splitting. All of the 1<sup>st</sup> year candidate varieties showed good resistance to splitting.

TABLE 14. MEAN % (ANGULAR TRANSFORMATION) TUBERS AFFECTED BY SPLITTING AFTER APPLYING STANDARD FORCE

Variety	Test Year		1-9 rating
	2007	2008	
Ulster Sceptre	49.0	80.9	<b>3.0</b>
Home Guard	1.8	3.2	<b>6.6</b>
Red Craigs Royal	58.3	73.2	<b>3.4</b>
Russet Burbank	64.7	66.0	<b>3.2</b>
Maris Peer	7.0	34.6	<b>5.9</b>
Record	23.1	18.0	<b>6.0</b>
Maris Piper	10.0	22.2	<b>6.2</b>
Mozart	40.0	13.5	<b>5.5</b>
Toluca	59.6	79.6	<b>2.4</b>
Daisy	11.8	0	<b>7.0</b>
Piccolo Star	-	7.8	6.5
Sylvanna	-	2.0	6.8
Lady Jo	-	9.1	6.4
Rudolph	-	14.3	6.2
Sofia	-	21.0	5.9
LSD (P=0.05)			<b>1.9</b>

2.3.2.7 **Internal Damage (bruising)** (Table 15)

The depth of bruising was much less in 2008 than in 2007. None of the candidate varieties showed a major weakness to bruising. Toluca was more susceptible than Record or Russet Burbank while Mozart showed strong resistance to bruising, scoring 6.6. Sofia was the most resistant of the 1<sup>st</sup> year varieties and Sylvanna appeared to be moderately susceptible. However, one year results need to be treated with some caution as there is no replication in the yearly test.

TABLE 15. MEAN DEPTH (MM) OF BRUISE AT POINT OF IMPACT OF STANDARD FORCE

Variety	Test Year		1-9 rating
	2006	2007	
Ulster Sceptre	6.8	3.5	<b>3.7</b>
Home Guard	4.6	2.6	<b>5.5</b>
Red Craigs Royal	5.0	3.7	<b>4.7</b>
Maris Peer	7.3	2.2	<b>4.4</b>
Record	5.4	3.3	<b>4.5</b>
Russet Burbank	5.7	4.9	<b>4.0</b>
Maris Piper	4.3	2.1	<b>6.0</b>
Mozart	3.4	1.9	<b>6.6</b>
Toluca	5.5	5.1	<b>3.7</b>
Daisy	3.5	3.6	<b>5.6</b>
Piccolo Star	-	2.5	5.7
Sylvanna	-	4.8	4.0
Lady Jo	-	3.0	5.4
Rudolph	-	4.3	4.4
Sofia	-	0.7	7.1
LSD (P=0.05)			<b>1.7</b>

2.3.2.8 **Potato Cyst Nematode (Table 16)**

Resistance to PCN (*G. rostochiensis* Ro1) is normally conferred by the major gene H1 and results in no, or minimal, multiplication of cysts on the potato. Varieties expressing this type of resistance to Ro1 were Mozart, Daisy, Piccolo Star, Sylvanna, Lady Jo and Sofia. None of the varieties were resistant to *G. pallida*.

TABLE 16. MULTIPLICATION OF CYSTS OF 3 PATHOTYPES OF POTATO CYST NEMATODE (*GLOBODERA ROSTOCHIENSIS*) PATHOTYPE 1, *G. PALLIDA* PATHOTYPES 2/3) ON TEST VARIETIES, EXPRESSED AS 1-9 RATING.

Variety	Ro1	Pa 2/3	Pa1
Estima	2 (S) <sup>†</sup>		1
Desiree	2 (S)	2 (S)	1
Maris Piper	9 (R)	2 (S)	
Mozart	<b>7 (R)</b>	<b>2 (S)</b>	
Toluca	<b>1 (S)</b>	<b>2 (S)</b>	
Daisy	<b>8 (R)</b>	<b>2 (S)</b>	
Piccolo Star	<b>9 (R)</b>	<b>2 (S)</b>	
Sylvanna	<b>9 (R)</b>	<b>2 (S)</b>	
Lady Jo	<b>9 (R)</b>	<b>3 (S)</b>	
Rudolph	<b>2 (S)</b>	<b>2 (S)</b>	
Sofia	<b>9 (R)</b>	<b>2 (S)</b>	

<sup>†</sup> R denotes full resistance and S denotes full susceptibility

**2.4 Discussion and Conclusions**

The full range of disease tests was completed on time with good disease development in all tests. As in previous years, some differences in the relative reactions of varieties were found between test years. For example, Daisy was much less susceptible to black scurf in 2008 than in 2007 when compared with the susceptible reference varieties. In contrast, Saxon appeared to be more susceptible to skin spot in 2008 than in 2007. Such yearly variation appears to be an inherent part of this type of testing and may be a consequence of differing disease pressures and environmental conditions in the test year. Conditions in a polytunnel will, for example, be affected by outside temperature, amount of sunshine and humidity and this could impact on disease pressure. The amount of disease pressure to which a variety is exposed can affect its

reaction as reported by Hilton *et al.* (2000) for silver scurf. The potential for variability in a variety's reaction needs to be recognised when considering ratings, particularly those based on one test in one year. In addition, it is always necessary to review methodology to try to obtain more uniform repeatable results. SASA has been examining the methodology for silver scurf and preliminary findings indicate that infesting compost will give greater and earlier development of silver scurf than dipping seed tubers in inoculum. Further work is being undertaken in 2009 to establish that varietal rankings are unaffected by this method of inoculation.

2008 saw the first year of testing with an isolate of 13\_A2 genotype which had been recovered from an R-gene differential plant at Ayr in 2007. This confirmed the change in the reaction of Stirling observed in 2007 with the ingress of this isolate into the test. Furthermore, there was good agreement between varietal reactions in 2007 and 2008 suggesting that the new genotype must have been present early in the epidemic, otherwise greater differences in varietal reactions over the two years might have been expected as happened in NL testing. Here, the inoculation of greenhouse plants and field-grown tubers was done with an old genotype in 2007 and the new one in 2008. The 2007 results for a small number of varieties had to be discarded because their reaction in 2007 was considerably more resistant than in 2008.

In the National List and IVT testing programmes, the resistance of a candidate variety to a range of diseases is evaluated in a series of standardised tests which each include a set of standard reference varieties whose reactions are known. For each disease, the resistance rating of a candidate variety is determined by comparing the amount of disease developing on the candidate variety with that on the standard varieties over at least two years of testing. The process of calculating variety scores is subject to regular review. As part of a review of NL decision making, statistical advice was that over-year means should be calculated from data for as many years as possible rather than two test years. This proposal has been adopted for NL analysis using data since 1981 and has been applied to IVT data for last four years. This has meant that small changes in some of the historic ratings ascribed to a variety have occurred, sometimes exacerbated by the process of rounding up or down to a whole number. For example, a variety scoring 3.7 for a character is recorded as 4, same as a variety scoring 4.4. Small shifts in the calculations may move these values up or down. Another factor which can affect ratings over time is a change to the rating for a reference variety because of evidence that varietal reaction operates on a wider scale than previously thought. This occurred with black scurf this year because some varieties e.g. Sarpo Una were considerably more resistant than Lady Christl. Users of such data should bear in mind that the final rating of a variety should,

therefore, be treated as a broad guide as to how a variety might perform in practice rather being an absolute value. Disease resistance ratings are recorded on a 1 to 9 scale where 1 is highly susceptible and 9 very resistant. Thus the higher the value, the more resistant a variety is to a disease. Typically, varieties with a score of 1, 2 or 3 would be considered highly susceptible, those with a score 4 or 5 considered susceptible, those with a score 6 or 7 moderately resistant and those with scores 8 or 9 highly resistant. A high resistance score should not be taken as indicating that a disease will be absent but that there is less risk of the disease developing on these varieties. With most other diseases and faults, all varieties can be affected to a greater or lesser extent. In consequence, the need for other control measures such as fungicide application should be evaluated, based on other factors such as the level of inoculum likely to be present and whether environmental conditions favour the pathogen.

The British Potato Variety Database was launched on the web in July, 2007 and formally presented to industry at the Potatoes in Practice event in August, 2007. This is now the mechanism for publication of both NL and IVT data and brings this data together with breeder's information formerly presented in publications such as "Scotland - The Natural Home of Potatoes". This database allows SASA to publish immediately variety information from various trials as soon as it is finalised. To date, the database has been accessed 41,500 times by 19,641 visitors from 122 countries since its launch. Each visitor has made an average of 6 searches and 87 % of visitors have been from UK with other main visitors being from USA, Canada, Australia, France, Spain, Germany, Netherlands, Ireland and China.

The 8 varieties which completed IVT in 2008 were Mozart, Toluca, Daisy, Richhill, Upmarket, Lulu, Charlemont and Excalibur. In summary, the key findings for these varieties are as follows:

### **Mozart**

Resistant to: **black dot, skin spot, internal damage** and **PCN Ro1**

Susceptible to: **dry rot – F. sulphureum** and **PCN Pa 2/3 and 1**

### **Toluca**

Resistant to: **foliage late blight, black scurf** and **black dot**

Susceptible to: **dry rot – F. sulphureum, external damage** and **PCN Ro1, Pa 2/3 and 1**

### Daisy

Resistant to: **black scurf, blackleg, external damage and PCN Ro1**

Susceptible to: **silver scurf, skin spot, dry rot – F. sulphureum and PCN Pa2/3 and 1**

### Richhill

Resistant to: **skin spot, blackleg, external damage and PCN Ro1**

Susceptible to: **PCN Pa2/3 and 1**

### Upmarket

Resistant to: **black dot, silver scurf, skin spot, blackleg, common scab and PCN Ro1**

Susceptible to: **black scurf, tuber late blight and PCN Pa2/3 and 1**

### Lulu

Resistant to: **black scurf, tuber late blight, powdery scab, common scab, internal damage and PCN Ro1**

Susceptible to: **dry rot – F. sulphureum and PCN Pa2/3 and 1**

### Charlemont

Resistant to: **black scurf, skin spot and PCN Ro1**

Susceptible to: **blackleg and PCN Pa 2/3 and 1**

### Excalibur

Resistant to: **blackleg, powdery scab and PCN Ro1**

Susceptible to: **skin spot, black scurf and PCN Pa2/3 and 1**

## **2.5 References**

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