



# **Research Project Report**

# **Independent Variety Trials**

# **2010**

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**Report Authors: J Kerr, SF Carnegie, H Campbell, K Heaton, D  
A'Hara (SASA), S Wale, D Kiezebrink (SAC),  
A Roberts, M Kirkwood (BioSS), A Lees (JHI)**

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# 1. SUMMARY

## 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 (now Potato Council (PCL)), it was 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 (now Science and Advice for Scottish Agriculture, SASA), SAC Commercial Ltd (SAC), Biomathematics & Statistics for Scotland (BioSS) and Scottish Crop Research Institute (SCRI) (now James Hutton Institute (JHI)) 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 PCL.

## 1.2. Work Undertaken and Findings

In 2010, tests were conducted on 6 varieties undergoing their 2nd year of UK NL testing, 13 varieties which had completed UK NL tests and 10 Common Catalogue varieties (Table 2). SASA conducted a test to determine susceptibility to foliage late blight at a site near Ayr which is operated in conjunction with JHI. 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 2010. Table 1a presents the final ratings for varieties completing the test programme. For varieties in the 1st 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.

	Emblem (12-04)	Crisps4All	Red Robin	Golden Nugget (47 C8R04)	Apache (150 PS 05)	Divaa (CA 99-1)	Trixie (00Z302A8)	Chaski (99H44B3)	Paru (99H56B2)	Chicago (98C051-002)	Sarpo Gwyn (96316A)	Lanorma	Nectar	Challenger	Amora	Victoria
Maturity	2E	EM	2E	M	EM	2E	M	M	M	M	LM	M	EM	M	2E	EM
Foliage late blight (field)	5	4	4	3	5	4	5	6	7	6	6	4	4	4	4	4
Black dot	5	3	5	6	4	5	5	5	6	6	6	6	6	5	5	5
Black scurf *																
Silver scurf	6	8	6	3	6	6	6	4	7	6	7	9	7	7	6	7
Skin spot	7	6	8	7	8	5	8	5	8	5	7	8	6	8	8	7
Foliage late blight (lab) ^	5	4	4	3	3	3	4	4	5	5	6	-	-	-	-	-
Tuber late blight	3	2	3	3	2	2	3	2	2	5	5	2	5	4	5	-
Blackleg - <i>Pectobacterium atrosepticum</i>	6	1	3	6	8	6	6	9	9	5	3	4	4	5	1	-
Powdery scab	5	3	6	8	5	3	6	7	8	5	6	4	5	5	3	-
Common scab	6	4	5	6	5	5	7	8	8	6	6	7	4	7	4	-
Dry rot - <i>Fusarium coeruleum</i>	8	6	8	7	4	7	7	3	7	8	4	9	5	6	7	8
Dry rot - <i>Fusarium sulphureum</i>	4	4	4	9	9	1	1	1	1	7	1	1	2	7	4	1
PCN Ro-1	9	9	9	6	3	3	3	3	2	9	9	9	1	2	8	-
PCN Pa 2/3	2	6	2	5	2	5	2	3	2	4	2	5	1	2	2	-
External damage (splitting)	8	8	7	7	8	7	5	8	8	8	7	4	6	6	8	-
Internal damage (bruising)	4	7	7	6	7	6	5	5	5	6	6	6	6	4	3	-

\* = Due to a high level of statistical variability in the Black Scurf test, resulting in inconsistent resistance ratings for this pathogen, scores for Black Scurf have not been published.

^ = The laboratory test for foliage late blight is only conducted as part of the NL programme, results have been included for information only

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 2005-2010 AND NL FROM 1981 EXCEPT FOR LATE BLIGHT FOR WHICH ANALYSIS COVERED ONLY PERIOD OF TESTING WITH A 13\_A2 GENOTYPE.

	Axona	Linton	SM-01-81-01	Tresdale	Clevna	Orwell	Lionheart (99C115-002)	Pioneer	Safari	Ramos	Orchestra	Mustang	Chopin
Maturity	LM	EM	EM	EM	EM	EM	M	2E	M	EM	M	EM	EM
Foliage late blight (field)	6	5	5	4	4	2	4	2	5	4	2	5	2
Black dot	6	5	5	6	5	5	6	5	6	5	5	5	6
Black scurf *													
Silver scurf	8	6	7	7	3	8	8	7	9	8	7	7	6
Skin spot	5	6	5	7	7	6	7	3	6	6	3	7	2
Foliage late blight (lab) ^	7	5	3	5	3	2	3	1	-	-	-	-	-
Tuber late blight	5	5	3	5	5	2	3	4	3	3	3	3	2
Blackleg- <i>Pectobacterium atrosepticum</i>	6	7	4	7	7	9	4	7	9	5	2	3	7
Powdery scab	5	6	6	4	6	3	6	7	5	6	7	5	6
Common scab	4	6	4	3	6	6	6	7	4	5	8	3	6
Dry rot – <i>Fusarium coeruleum</i>	5	6	8	6	8	4	8	4	7	8	2	7	5
Dry rot – <i>Fusarium sulphureum</i>	1	3	9	1	3	5	1	1	5	5	1	2	3
PCN Ro-1	2	9	8	4	2	2	3	8	7	8	7	7	8
PCN Pa 2/3	2	2	5	2	2	3	2	2	2	4	2	3	3
External damage (splitting)	4	5	8	7	7	4	6	6	6	6	5	7	7
Internal damage (bruising)	5	3	3	6	4	6	6	4	6	5	5	7	7

\* = Due to a high level of statistical variability in the Black Scurf test, resulting in inconsistent resistance ratings for this pathogen, scores for Black Scurf have not been published.

^ = The laboratory test for foliage late blight is only conducted as part of the NL programme, results have been included for information only

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).

### 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:

#### **Emblem (12-04)**

Resistant to: **skin spot, dry rot – *F. coeruleum*, external damage and PCN Ro1.**

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

#### **Crisps4All**

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

Susceptible to: **black dot, tuber late blight, blackleg and powdery scab.**

#### **Red Robin**

Resistant to: **skin spot, dry rot – *F. coeruleum*, external damage, internal damage and PCN Ro1.**

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

#### **Golden Nugget (47 C8R04)**

Resistant to: **skin spot, powdery scab, dry rot – *F. coeruleum* and *F. sulphureum* and external damage.**

Susceptible to: **foliage late blight, silver scurf and tuber late blight.**

#### **Apache (150 PS 05)**

Resistant to: **skin spot, blackleg, dry rot - *F. sulphureum*, external damage and internal damage.**

Susceptible to: **tuber late blight, PCN Ro1 and PCN Pa 2/3 and 1.**

#### **Divaa (CA 99-1)**

Resistant to: **dry rot – *F. coeruleum* and external damage.**

Susceptible to: **tuber late blight, powdery scab, dry rot - *F. sulphureum* and PCN Ro1.**

#### **Trixie (00Z302A8)**

Resistant to: **skin spot, common scab and dry rot – *F. coeruleum*.**

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

#### **Chaski (99H44B3)**

Resistant to: **blackleg, powdery scab, common scab and external damage.**

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

#### **Paru (99H56B2)**

Resistant to: **foliage late blight, silver scurf, skin spot, blackleg, powdery scab, common scab, dry rot – *F. coeruleum* and external damage.**

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

#### **Chicago (98C051-002)**

Resistant to: **dry rot – *F. coeruleum* and *F. sulphureum*, external damage and PCN Ro1.**

#### **Sarpo Gwyn (96136A)**

Resistant to: **silver scurf, skin spot, external damage and PCN Ro1.**

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



### **Lanorma**

Resistant to: **silver scurf, skin spot, common scab, dry rot – *F. coeruleum*, and PCN Ro1.**

Susceptible to: **tuber late blight and dry rot - *F. sulphureum*.**

### **Nectar**

Resistant to: **silver scurf.**

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

### **Challenger**

Resistant to: *silver scurf, skin spot, common scab, and dry rot - *F. sulphureum** Susceptible to: **PCN Ro1 and PCN Pa 2/3 and 1.**

### **Amora**

Resistant to: **skin spot, dry rot – *F. coeruleum*, external damage and PCN Ro1.**

Susceptible to: **blackleg, powdery scab, internal damage and PCN Pa 2/3 and 1.**

### **Victoria.**

Resistant to: **silver scurf, skin spot and dry rot - *F. coeruleum***

Susceptible to: *dry rot - *F. sulphureum*.*

### **Axona**

Resistant to: *silver scurf.*

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

### **Linton**

Resistant to: **blackleg and PCN Ro1.**

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

### **SM-01-81-01**

Resistant to: *silver scurf, dry rot – *F. coeruleum* and *F. sulphureum*, external damage and PCN Ro1.*

Susceptible to: **tuber late blight, and internal damage.**

### **Tresdale**

Resistant to: *silver scurf, skin spot, blackleg and external damage.*

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

### **Clevna**

Resistant to: *skin spot, blackleg, dry rot - *F. coeruleum* and external damage.*

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

### **Orwell**

Resistant to: *silver scurf and blackleg.*

Susceptible to: *foliage late blight, tuber late blight, powdery scab, PCN Pa 2/3 and Ro1.*

### **Lionheart (99C115-002)**

Resistant to: *silver scurf, skin spot and dry rot – *F. coeruleum*.*

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

### **Pioneer**

Resistant to: *silver scurf, blackleg, powdery scab, common scab and PCN Ro1.*

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

### **Safari**

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

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

### **Ramos**

Resistant to: *silver scurf, dry rot – F. coeruleum, and PCN Ro1.*

Susceptible to: *tuber late blight.*

### **Orchestra**

Resistant to: *silver scurf, powdery scab, common scab and PCN Ro1.*

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

### **Mustang**

Resistant to: *silver scurf, skin spot, dry rot – F. coeruleum, external damage, internal damage and PCN Ro1.*

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

### **Chopin**

Resistant to: *blackleg, **PCN Ro1**, internal damage and external damage.*

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

## 2. 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 PCL 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 Yo, 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 JHI. 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 growing seasons 2008-2010. This report summarises the testing conducted over the 2010-2011 season.

### 3. MATERIALS AND METHODS

#### 3.1. Standard Varieties

The standard varieties used in 2009 were reviewed and mainly retained in 2010, except that Blue Danube was added as a Black Scurf control and Orla was dropped as a late blight control. Three of the late blight control varieties are listed with different resistance rating from previous reports, due to results obtained with the new isolate. 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, 2\*], Bintje [M, 2], Russet Burbank [M, 3], Valor [M, 6\*], Cara [M, 6], Sarpo Mira [M, 7\*]

\* = Resistance rating has changed in response to work carried out with the new isolate

**Black scurf:** Sante [M, 3], Duke of York [1E, 5], Saxon [2E, 5], King Edward [M, 6], Cara [M, 7], Lady Christl [1E, 8], Blue Danube [M,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]

### 3.2. Varieties in Trial

In line with the policy established by PCL, for the varieties submitted for UK National List Trials, only those varieties entering the 2nd 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 to prevent the introduction of non-indigenous bacterial pathogens, all seed potatoes from non-Scottish sources were tested for brown rot (*Ralstonia solanacearum*, ring rot (*Clavibacter michiganensis* subsp. *sepedonicus*) and *Dickeya* spp. bacteria.

UK National List				Stage of test 2010	
AFP	Variety	Breeder/Agent	Maturity	NL	IVT
4/746	Emblem (12-04)	Caithness Varieties Ltd	2nd Early	Completed	2
4/747	Crisps4All	HZPC Holland BV/HZPC Research	E. Maincrop	Completed	2
4/748	Red Robin	Jalving Potatoes UK Ltd	2nd Early	Completed	2
4/749	Golden Nugget (C8R04) (47)	Zella J Doig	Maincrop	Completed	2
4/750	Apache (150 PS 05)	Zella J Doig	E. Maincrop	Completed	2
4/751	Divaa (CA 99-1)	Caithness Potatoes Ltd	2nd Early	Completed	2
4/752	Trixie (00Z302A8)	JHI/MRS Ltd	Maincrop	Completed	2
4/753	Chaski (99H44B3)	JHI/MRS Ltd	Maincrop	Completed	2
4/754	Paru (99H56B2)	JHI/MRS Ltd	Maincrop	Completed	2
4/756	Chicago (98C051-002)	Cygnets PB Ltd	Maincrop	Completed	2
4/759	Sarpo Gwyn (96316A)	Sarvari Research Trust	L. Maincrop	Completed	2
4/693	Axona	Sarvari Research Trust	L. Maincrop	Completed	1
4/731	Linton	PepsiCo Intl Ltd	E. Maincrop	Completed	1
4/760	SM-01-81-01	Caithness Potatoes Ltd	E. Maincrop	2	1
4/761	Tresdale	Jack Dunnett	E. Maincrop	2	1
4/762	Clevna	Jack Dunnett	E. Maincrop	2	1
4/764	Orwell	PepsiCo Intl Ltd	E. Maincrop	2	1
4/766	Lionheart (99C115-002)	Cygnets PB Ltd	Maincrop	2	1
4/768	Pioneer	JHI/MRS Ltd	2nd Early	2	1

TABLE 2. VARIETIES IN IVT IN 2010

Common catalogue				Stage of test 2010	
AFP	Variety	Breeder/Agent	Maturity	NL	IVT
	Lanorma	Van Rijn/Branston	Maincrop	-	2
	Nectar	IPM	E. Maincrop	-	2
	Challenger	HZPC	Maincrop	-	2
	Amora	B Schaap/Potato Innovations	2nd Early	-	2
	Victoria	HZPC	E. Maincrop	-	2*
	Safari	Stet/Branston	Maincrop	-	1
	Ramos	Van-rijn - KWS B.V.	E. Maincrop	-	1
	Orchestra	Meijer/Potato Innovations	Maincrop	-	1
	Mustang	NOS Austria/Agrico	E. Maincrop	-	1
	Chopin	HZPC UK Ltd	E. Maincrop	-	1

\* IVT tests (complete 2010) and dry rot (complete 2011) only

TABLE 2. (CONTINUED) VARIETIES IN IVT IN 2010

### 3.3. IVT Test Methods

The test methods used were those agreed and set out in the standard protocols prepared for the 2008 programme with the exception of the silver scurf trial. The silver scurf method was changed in 2010 in response to research undertaken at SASA comparing inoculation protocols. This development work was reported in the IVT annual report 2009-2010. Details of this year's tests are provided below:

#### 3.3.1. Foliage late blight in the field, 2010

The test tubers were planted in plots of 2 tubers at Dalrymple, by Ayr. The 2nd early/maincrop experiments were planted on 13 May; there were no 1st early varieties. The layout was a randomised block design with 4 replications, each of 2 tubers. Plants of King Edward, in small pots, infected by a complex isolate (1.2.3.4.6.7.10.11) of *P. infestans* were laid out along the adjacent rows of King Edward on 6 July. On 19, 23, 27 and 30 July, 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.

#### 3.3.2. Skin spot, 2010

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 10 May. Pots were placed outdoors in peat beds on 10 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 31 August at the half the manufacturer's recommended rate. The tubers were harvested into separate plastic boxes on 25 and 27 October and then stored at 5-8°C until the fourth week in March. The % surface area affected by skin spot was recorded in 5 categories and a surface infection index calculated (Boyd, 1957).

### **3.3.3. Silver scurf, 2010**

Petri dishes containing 2% malt extract agar were inoculated using three isolates of silver scurf which were grown for a minimum of 14 days, then macerated in sterile distilled water. The suspension was added to Bulrush compost at a rate of 1L of suspension per 42L of soil and mixed in a small cement mixer. The test tubers were planted in pots containing the infested soil and placed in a polytunnel on 26 May and watered by drip irrigation into each pot. The layout was a randomised block design with 6 replications. Haulms were allowed to senesce naturally. Tubers were harvested on 14 October into separate plastic boxes and washed so visible symptoms could be observed, the tubers were then stored at 12-15°C. As silver scurf lesions had developed sufficiently on the susceptible standard varieties an assessment was conducted on 21 and 22 October. 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.

### **3.3.4. Black dot, 2010**

Three isolates of *Colletotrichum coccodes* were cultured in Petri dishes on PDA agar. 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 20 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 4 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 overnight in a cold store. The % surface area affected by black dot was then assessed on the 11 October 2010.

### **3.3.5. Black scurf, 2010**

Three isolates of *Rhizoctonia solani* AG-3 were grown in Petri dishes on PDA agar. 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 27 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 5 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 12 October 2010.

### 3.3.6. 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 2010". 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°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°C and the incidence of splitting at the point of impact is recorded. Tubers for the bruising test are stored at 9-11°C and the depth of damage at point of impact measured.

### 3.3.7. 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 six 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.



## **4. RESULTS**

Ring rot, brown rot and *Dickeya* bacteria were not found in tested seed potatoes.

### **4.1. IVT Tests**

#### **4.1.1. Foliage late blight (field)**

##### **4.1.1.1. Summary of 2009/2010 Trials (Table 3)**

Late blight was recorded on some varieties at a very low severity on 19 July with slow progress by 23 July. However, by 27 July, late blight on susceptible varieties had progressed well and the foliage of all but the most resistant varieties was dead by 30 July. The AUDPC values on the reference varieties in 2010 were similar to those in 2009. Unfortunately, no plants of R9 differential grew from planted tubers. Foliage of the differentials R1, R2, R3, R4, R5, R6, R7, R10 and R11 was killed by late blight. No growing lesions developed on plants of R8 differential. This confirmed the results of detached leaflet tests that the virulence of isolate was 1.2.3.4.5.6.7.10.11.

Paru (6.5), Chaski (6.4) and Sarpo Gwyn (6.3) were the most resistant candidate varieties undergoing IVT trialling in 2010, but all 3 were still significantly less resistant than the Sarpo Mira (8.0) standard. Chicago and Apache had some level of resistance scoring 5.4 and 5.2 respectively. The remaining varieties were relatively susceptible, with Golden Nugget (2.1) being the most susceptible variety on test, with a score lower than the 3 susceptible control varieties Home Guard (2.5), Russet Burbank (2.9) and Binje (3.0).

##### **4.1.1.2. 2010 Trial (Table 3)**

Chopin (1.3) and Orchestra (1.0) were the most susceptible 1st year candidate varieties in 2010, with scores ranking lower than the susceptible control varieties. Safari was moderately resistant with a score of 5.4, while Ramos and Mustang showed less resistance with scores of 3.5 and 4.4 respectively.

Variety	Test Year		1-9 rating
	2009	2010	
BINTJE	43.9	42.7	3.0
CARA	29.5	30.2	5.5
HOME GUARD	*	45.8	2.5
RUSSET BURBANK	43.2	44.0	2.9
SARPO MIRA	14.0	19.2	8.0
VALOR	26.7	27.3	6.1
EMBLEM	32.5	33.8	4.9
CRISPS4ALL	40.5	42.6	3.3
RED ROBIN	37.7	42.5	3.6
GOLDEN NUGGET	48.9	46.9	2.1
APACHE	31.9	31.2	5.2
DIVAA	40.2	39.3	3.7
TRIXIE	36.1	35.4	4.4
CHASKI	28.3	22.2	6.4
PARU	25.6	24.1	6.5
CHICAGO	27.9	32.6	5.4
SARPO GWYN	26.4	24.5	6.3
AMORA	36.1	40.0	4.0
CHALLENGER	42.1	41.2	3.3
LANORMA	36.4	39.6	4.0
VICTORIA	42.5	35.7	3.8
NECTAR	44.0	40.2	3.2
CHOPIN	-	50.7	1.3
MUSTANG	-	36.1	4.4
ORCHESTRA	-	54.0	1.0
RAMOS	-	40.4	3.5
SAFARI	-	31.6	5.4
AXONA	-	28.1	6.1
LINTON	-	36.1	4.4
SM-01-81-01	-	32.6	5.1
TRESDALE	-	38.9	3.8
CLEVNA	-	40.7	3.4
ORWELL	-	48.8	1.7
LIONHEART	-	40.6	3.5
PIONEER	-	52.1	1.0
LSD (P0.05)	3.9	4.7	1.1 / 4.7

\* = no data available

TABLE 3. MEAN % (ANGULAR TRANSFORMATION) AREA UNDER DISEASE PROGRESS IN FOLIAGE LATE BLIGHT FIELD TEST IN 2009 AND 2010.

#### 4.1.2. Black scurf

Due to a high level of statistical variability in the Black Scurf test results, leading to inconsistent resistance ratings for this pathogen, scores for Black Scurf have not been published.

#### 4.1.3. Black dot

##### Summary of 2009/10 Trials (Table 4)

Most varieties were moderately resistant, with no varieties scoring definitive susceptible or resistant scores. Paru and Lanorma both scored 6.1 which equalled

the score obtained by the most resistant control variety Cara. Crisps4All and Apache were the most susceptible varieties with scores of 3.4 and 3.8 respectively.

#### 2010 Test (Table 4)

All of the 1st year varieties showed some resistance to black dot with Safari and Chopin being most resistant, scoring 6.0 and 5.9 respectively. Ramos was the least resistant candidate variety with a score of 4.9.

Variety	Test Year		1-9 rating
	2009	2010	
CARA	5.2	6.7	<b>6.1</b>
FIANNA	12.9	8.4	<b>5.2</b>
LADY CHRISTL	15.7	15.2	<b>4.4</b>
P SQUIRE	22.6	23.8	<b>3.0</b>
SAXON	6.3	6.5	<b>6.0</b>
EMBLEM	14.9	8.6	<b>5.0</b>
CRISPS4ALL	31.1	10.7	<b>3.4</b>
RED ROBIN	14.1	13.1	<b>4.7</b>
GOLDEN NUGGET	5.5	15.0	<b>5.3</b>
APACHE	22.1	15.6	<b>3.8</b>
DIVAA	18.1	10.6	<b>4.6</b>
TRIXIE	15.8	12.7	<b>4.6</b>
CHASKI	13.1	11.7	<b>4.9</b>
PARU	6.5	4.6	<b>6.1</b>
CHICAGO	8.6	6.7	<b>5.8</b>
SARPO GWYN	7.8	11.7	<b>5.4</b>
AMORA	15.4	9.6	<b>4.9</b>
CHALLENGER	13.4	14.6	<b>4.6</b>
LANORMA	5.9	5.4	<b>6.1</b>
NECTAR	10.5	7.6	<b>5.5</b>
VICTORIA	20.0	8.5	<b>4.6</b>
CHOPIN	-	7.0	<b>5.9</b>
MUSTANG	-	10.9	<b>5.2</b>
ORCHESTRA	-	10.9	<b>5.2</b>
RAMOS	-	13.0	<b>4.9</b>
SAFARI	-	6.3	<b>6.0</b>
AXONA	-	7.5	<b>5.8</b>
LINTON	-	8.8	<b>5.6</b>
SM-01-81-01	-	13.3	<b>4.8</b>
TRESDALE	-	6.1	<b>6.1</b>
CLEVNA	-	9.2	<b>5.5</b>
ORWELL	-	11.7	<b>5.1</b>
LIONHEART	-	5.5	<b>6.2</b>
PIONEER	-	8.9	<b>5.6</b>
LSD (P0.05)	1.6	6.2	<b>5.3 / 5.3</b>

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

#### 4.1.4. Silver scurf

##### Summary of 2009/2010 Trials (Table 5)

There was generally greater disease severity in the 2009 trial compared with the 2010 trial. Overall, candidate varieties showed a good level of resistance, with 14 of the 16 varieties on test scoring above 5. Lanorma (8.9), Crisps4All (7.6) and Challenger (7.2)

were the most resistant candidate varieties. Golden Nugget (3.8) and Chaski (4.8) were the least resistant varieties on test.

### 2010 test (Table 5)

All 1st year varieties showed a degree of resistance with Safari being the most resistant, scoring 7.0, and Linton having the lowest rating with a score of 5.5.

Variety	Test Year		1-9 rating
	2009	2010	
CARA	40.9	12.2	7.0
FIANNA	36.4	14.0	7.3
LADY CHRISTL	44.9	51.8	2.0
P SQUIRE	42.3	31.4	4.6
ROMANO	35.5	12.3	7.6
SAXON	43.1	28.3	4.9
EMBLEM	40.5	22.2	5.9
CRISPS4ALL	33.9	13.9	7.6
RED ROBIN	43.5	17.6	6.1
GOLDEN NUGGET	45.0	36.2	3.8
APACHE	41.8	18.2	6.2
DIVAA	39.2	22.1	6.1
TRIXIE	33.4	30.2	5.8
CHASKI	40.1	32.1	4.8
PARU	31.4	22.5	6.9
CHICAGO	41.4	17.5	6.3
SARPO GWYN	39.0	14.9	6.9
AMORA	35.7	23.6	6.3
CHALLENGER	24.7	26.9	7.2
VICTORIA	37.2	15.0	7.1
NECTAR	39.6	13.6	7.0
LANORMA	25.3	11.4	8.9
CHOPIN	-	21.1	5.9
MUSTANG	-	18.1	6.3
ORCHESTRA	-	17.3	6.4
RAMOS	-	15.3	6.6
SAFARI	-	11.9	7.0
AXONA	-	12.6	6.9
LINTON	-	23.8	5.5
SM-01-81-01	-	19.9	6.0
TRESDALE	-	16.9	6.4
CLEVNA	-	35.1	4.1
ORWELL	-	12.8	6.9
LIONHEART	-	13.7	6.8
PIONEER	-	19.6	6.1
LSD (P0.05)	10.8	6.5	3.2 \ 6.5

TABLE 5. MEAN % (ANGULAR TRANSFORMATION) SURFACE ARE AFFECTED BY SILVER SCURF

### 4.1.5. Skin spot

#### Summary of 2009/2010 Trials (Table 6)

The severity of skin spot symptoms was considerably greater in 2009 than in 2010, with large differences in disease susceptibility being recorded between the two years for some of the reference varieties. Most of the varieties completing IVT testing were

moderately resistant to skin spot, although five varieties were highly resistant with scores above 7.0. Challenger, Paru and Red Robin were the most resistant, scoring 7.5, 7.2 and 7.1 respectively, which all rank higher than the most resistant control variety, Romano (7.0). Divaa and Chaski were the least resistant varieties with scores of 3.8 and 4.0 respectively.

### 2010 Test (Table 6)

Of the 1st year candidate varieties, Orchestra, Pioneer and Chopin were completely susceptible, scoring only 1.0, while Tresdale was the most resistant with a score of 8.2. Clevna and Lionheart were also relatively resistant with scores of 7.9 and 7.6 respectively.

Variety	Test Year		1-9 rating
	2009	2010	
FIANNA	9.8	1.5	6.1
KING EDWARD	31.4	8.2	1.0
P SQUIRE	24.0	8.2	2.0
ROMANO	5.2	1.6	7.0
SANTE	32.8	10.7	1.0
SAXON	8.7	0.6	6.5
EMBLEM	8.5	0.4	6.6
CRISPS4ALL	14.0	3.8	4.8
RED ROBIN	4.7	1.3	7.1
GOLDEN NUGGET	5.9	5.9	6.0
APACHE	6.4	0.5	7.0
DIVAA	19.2	3.9	3.8
TRIXIE	4.9	1.7	7.0
CHASKI	11.1	10.9	4.0
PARU	4.9	0.8	7.2
CHICAGO	18.0	0.6	4.7
SARPO GWYN	9.0	3.3	5.9
AMORA	5.5	1.5	6.9
CHALLENGER	3.4	0.6	7.5
LANORMA	6.0	1.0	6.9
VICTORIA	9.6	0.9	6.3
NECTAR	13.1	1.2	5.5
CHOPIN	-	14.5	1.0
MUSTANG	-	0.9	7.5
ORCHESTRA	-	10.7	1.0
RAMOS	-	5.0	4.4
SAFARI	-	3.4	5.7
AXONA	-	6.1	3.6
LINTON	-	6.4	3.4
SM-01-81-01	-	6.4	3.4
TRESDALE	-	0.0	8.2
CLEVNA	-	0.4	7.9
ORWELL	-	4.0	5.2
LIONHEART	-	0.8	7.6
PIONEER	-	11.4	1.0
LSD (P0.05)	7.5	4.2	3.8 \ 4.2

TABLE 6. MEAN % (ANGULAR TRANSFORMATION) SURFACE AREA AFFECTED BY SKIN SPOT.

## 4.2. NL Tests

### 4.2.1. Tuber late blight

Of the candidate varieties entered for testing, Lanorma was the most susceptible with a score of 1.8. Nectar was the most resistant variety with a score of 4.6. The 1<sup>st</sup> year varieties were relatively susceptible, all scoring 2.8 or less.

Variety	Test Year		1-9 rating
	2009	2010	
BINTJE	90.0	87.0	2.0
CARA	45.3	52.9	6.0
SARPO MIRA	78.5	84.8	2.7
VALOR	35.0	46.1	6.9
AMORA	65.8	62.8	4.5
CHALLENGER	84.3	61.8	3.6
NECTAR	58.4	68.3	4.6
LANORMA	90.0	90.0	1.8
CHOPIN	-	87.0	2.0
MUSTANG	-	83.7	2.4
ORCHESTRA	-	84.1	2.3
RAMOS	-	82.7	2.5
SAFARI	-	80.0	2.8
LSD (P0.05)	13.7	13.3	1.5 \ 14.4

TABLE 7. MEAN % (ANGULAR TRANSFORMATION) TUBERS AFFECTED BY LATE BLIGHT

### 4.2.2. Blackleg (*Pectobacterium atrosepticum*)

Generally more blackleg developed in the 2010 trial, compared with 2009. Challenger obtained the highest resistance score with moderate 5.8. Amora was the most susceptible variety scoring only 1.0. Of the 1st year varieties entered, there was a wide spread of resistance ratings. Safari and was the most resistant variety scoring 9.0. Orchestra (1.0) was the most susceptible variety, followed by Mustang (1.6).

Variety	Test Year		1-9 rating
	2009	2010	
AILSA	0.0	7.5	8.0
CONCURRENT	37.1	47.1	3.0
CULTRA	9.2	21.5	7.4
ESTIMA	16.4	55.0	4.1
MORENE	26.1	54.1	4.3
AMORA	63.3	62.8	1.0
CHALLENGER	16.4	34.4	5.8
NECTAR	33.2	43.6	3.8
LANORMA	27.7	43.0	4.3
CHOPIN	-	15.0	7.3
MUSTANG	-	49.9	1.6
ORCHESTRA	-	60.5	1.0
RAMOS	-	31.1	4.7
SAFARI	-	3.1	9.0
LSD (P0.05)	14.4	13.3	3.0 \ 13.3

TABLE 8. MEAN % (ANGULAR TRANSFORMATION) PLANTS AFFECTED BY BLACKLEG (*PECTOBACTERIUM ATROSEPTICUM*)

### 4.2.3. Common Scab

Maris Piper and Home Guard were the most susceptible of the reference varieties, each scoring 2.0, closely followed by Desiree with a score of 2.8. Of the varieties completing testing, Challenger and Lanorma were the most resistant with scores of 6.6 and 6.2 respectively. Nectar was the most susceptible variety with a score of 3.5.

Of the varieties in their 1st year of testing, Orchestra was the most resistant with a score of 7.1 which was slightly higher than the score obtained by the most resistant control variety, P. Crown (7.0). Mustang was the most susceptible variety on test (2.7).

Variety	Test Year		1-9 rating
	2009	2010	
DESIREE	50.4	58.9	2.8
ESTIMA	37.0	40.6	6.2
HOME GUARD	57.4	64.7	2.0
MARIS BARD	63.7	58.4	3.2
MARIS PEER	54.1	56.7	3.4
MARIS PIPER	59.0	59.3	2.0
P CROWN	42.9	37.6	7.0
NECTAR	55.3	49.8	3.5
CHALLENGER	39.6	43.4	6.6
LANORMA	34.8	50.9	6.2
AMORA	58.5	45.9	3.6
CHOPIN	-	45.1	5.7
MUSTANG	-	57.6	2.7
ORCHESTRA	-	39.6	7.1
RAMOS	-	51.0	4.3
SAFARI	-	52.4	3.9
LSD (P0.05)	14.0	11.1	3.4 \ 4.2

TABLE 9. MEAN % (ANGULAR TRANSFORMATION) SURFACE AREA AFFECTED BY COMMON SCAB

### 4.2.4. Powdery Scab

Overall, the severity of powdery scab was broadly similar in both years. Estima continued to be clearly more susceptible than any of the other reference varieties. Amora was the most susceptible candidate variety with a score of 3.1 and Challenger offered the most resistance with a score of 5.4.

Most of the 1st year candidate varieties offered moderate to good resistance, with Orchestra (8.1) being the most resistant.

Variety	Test Year		1-9 rating
	2009	2010	
ACCENT	21.7	10.9	6.7
CARA	17.8	12.4	6.9
ESTIMA	35.1	33.5	3.0
P CROWN	15.2	8.8	7.5
SANTE	10.1	9.3	8.0
AMORA	38.4	29.1	3.1
NECTAR	31.6	19.1	4.8
LANORMA	23.4	29.2	4.6
CHALLENGER	27.2	18.0	5.4
CHOPIN	-	14.9	6.9
MUSTANG	-	16.7	6.5
ORCHESTRA	-	8.8	8.1
RAMOS	-	15.4	6.7
SAFARI	-	21.6	5.5
LSD (P0.05)	8.0	5.8	1.5

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

#### 4.2.5. Dry rot (*Fusarium* spp.)

##### 4.2.5.1. *F. solani* var. *coeruleum*

Resistance levels were generally good with the candidate variety Lanorma (8.4) achieving a higher score than the most resistant reference variety, Sante (8.0). The least resistant variety was Nectar which still obtained a moderately high score of 5.4.

Of the 1st year varieties, Orchestra was the only susceptible variety with a score of 1.4. Two 1st year varieties were highly resistant with scores above 7.0. These were Victoria (8.4) and Ramos (8.2).

Variety	Test Year		1-9 rating
	2009	2010	
CATRIONA	51.8	48.6	2.2
ESTIMA	35.2	23.2	5.1
NADINE	15.2	17.2	7.0
P SQUIRE	52.8	35.7	3.0
SANTE	7.0	10.9	8.0
AMORA	21.5	14.4	6.7
NECTAR	30.1	24.1	5.4
LANORMA	7.7	4.1	8.4
CHALLENGER	25.4	20.2	6.0
SAFARI	-	18.3	6.5
RAMOS	-	10.0	8.2
ORCHESTRA	-	43.6	1.4
MUSTANG	-	16.9	6.8
CHOPIN	-	27.7	4.6
VICTORIA	-	8.9	8.4
LSD (P0.05)	8.0	6.5	1.7 / 6.5

TABLE 11. MEAN % (ANGULAR TRANSFORMATION) INTERNAL AREA AFFECTED BY *FUSARIUM COERULEUM*



#### 4.2.5.2. *F. sulphureum*

There was generally more disease recorded in 2009 than 2010. Challenger was the most resistant variety with a score of 7.5. Lanorma and Nectar were completely susceptible, scoring only 1.0.

Of the 1<sup>st</sup> year varieties, Safari (8.2) and Ramos (8.1) were the most resistant varieties, with Safari equalling the most resistant control variety, Saxon (8.2). Orchestra (1.0) and Victoria (1.0) were the most susceptible varieties, with the other two varieties on test, Mustang and Chopin, scoring 4.4 and 5.6 respectively.

Variety	Test Year		1-9 rating
	2009	2010	
ATLANTIC	24.4	23.7	3.1
MARIS PIPER	29.9	*	3.0
NADINE	30.1	16.1	3.6
SANTE	18.2	*	8.0
SAXON	16.2	8.2	8.2
AMORA	31.7	16.7	3.1
CHALLENGER	19.7	8.1	7.5
LANORMA	51.3	34.9	1.0
NECTAR	38.9	29.7	1.0
SAFARI	-	13.8	8.2
RAMOS	-	14.2	8.1
ORCHESTRA	-	44.2	1.0
MUSTANG	-	28.3	4.4
CHOPIN	-	23.8	5.6
VICTORIA	-	43.0	1.0
LSD (P0.05)	9.4	6.1	6.1 \ 6.4

\* = indicative score only. The control variety results were the opposite of those expected in 2010, so the data was reversed for the analysis to give indicative scores for the candidate varieties.

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

#### 4.2.6. External Damage (splitting)

The incidence of splitting was variable for some varieties between the two years of testing. For example, Challenger and Nectar each had lower damage scores in 2009 than in 2010, but this trend was not seen for all varieties. Overall the majority of varieties showed moderate resistance. Amora (7.5) showed the most resistance, while Lanorma (4.6) had the least resistance of the candidate varieties on test. Of the reference varieties, Ulster Sceptre (1.9) and Russet Burbank (1.6) were most susceptible to splitting damage, while the remaining reference varieties showed moderate resistance.

Of the 1<sup>st</sup> year candidate varieties, the most resistant varieties were Chopin (6.6), Mustang (6.6) and Ramos (6.0). Orchestra was the least resistant variety on test with a score of 4.4.

Variety	Test Year		1-9 rating
	2009	2010	
ULSTER SCEPTRE	*	78.4	1.9
HOME GUARD	*	39.2	5.1
RED CRAIGS ROYAL	54.9	40.0	4.4
RUSSET BURBANK	87.8	77.1	1.6
RECORD	31.3	25.0	6.0
MARIS PIPER	22.0	38.0	5.8
MARIS PEER	41.1	37.7	5.1
AMORA	14.6	4.0	7.5
CHALLENGER	13.7	32.7	6.4
LANORMA	44.0	46.9	4.6
NECTAR	16.0	42.0	5.9
CHOPIN	-	18.0	6.6
MUSTANG	-	18.0	6.6
ORCHESTRA	-	43.1	4.4
SAFARI	-	28.0	5.7
RAMOS	-	25.5	6.0
LSD (P0.05)			2.6

TABLE 13. MEAN % (ANGULAR TRANSFORMATION) TUBERS AFFECTED BY SPLITTING AFTER APPLYING STANDARD FORCE

#### 4.2.7. Internal Damage (bruising)

Nectar was the most resistant to bruising with a score of 5.8. The most resistant reference variety, Maris Piper only scored 6.0. Challenger was most susceptible candidate variety with a score of 2.2.

For the 1st year varieties, Mustang (7.0) and Chopin (6.7) were the most resistant varieties, obtaining scores higher than the resistant reference varieties. Ramos was the most susceptible scoring 3.5.

Variety	Test Year		1-9 rating
	2009	2010	
ULSTER SCEPTRE	*	4.5	1.5
HOME GUARD	*	2.5	4.8
RED CRAIGS ROYAL	2.2	3.3	3.4
RUSSET BURBANK	4.6	3.0	4.0
RECORD	3.2	3.4	3.3
MARIS PIPER	3.6	1.7	6.0
MARIS PEER	3.0	2.6	4.6
AMORA	5.7	2.4	4.9
CHALLENGER	3.8	4.1	2.2
LANORMA	0.9	3.1	3.7
NECTAR	1.9	1.9	5.8
CHOPIN	-	1.3	6.7
MUSTANG	-	1.1	7.0
ORCHESTRA	-	2.7	4.4
RAMOS	-	3.3	3.5
SAFARI	-	1.9	5.7
LSD (P0.05)			6.2

TABLE 14. MEAN DEPTH (MM) OF BRUISE AT POINT OF IMPACT OF STANDARD FORCE

#### 4.2.8. Potato Cyst Nematode

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 Chopin, Safari, Ramos, Orchestra and Mustang.

VARIETY	Ro1	Pa 2/3	Pa1
DESIREE	2 (S)	2 (S)	2 (S)
ESTIMA	2 (S)	*	*
MARIS PIPER	8 (R)	2 (S)	2 (S)
SAFARI	7 (R)	2 (S)	*
RAMOS	7 (R)	4	*
ORCHESTRA	7 (R)	2 (S)	*
MUSTANG	7 (R)	3 (S)	*
CHOPIN	8 (R)	3 (S)	*
LANORMA	*	4	*
12380	8 (R)	7 (R)	5
VANTAGE	6	5	6
MORAG	5	4	4
VALES EVEREST	*	6	7 (R)
INNOVATOR	*	8 (R)	8 (R)

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

TABLE 15. MULTIPLICATION OF CYSTS OF 3 PATHOTYPES OF POTATO CYST NEMATODE (*GLOBODERA ROSTOCHIENSIS*) PATHOTYPE 1; *G. PALLIDA* PATHOTYPES ) ON TEST VARIETIES, EXPRESSED AS 1-9 RATING.

## 5. DISCUSSION AND CONCLUSIONS

The full range of disease tests was completed on time with reasonable disease development in all tests. In some tests e.g. silver scurf, skin spot, and *F. sulphureum*, disease severity was less in 2010 than in 2009 whereas the reverse occurred with blackleg. As in previous years, some differences in the relative reactions of varieties were found between test years. For example, Victoria was much less susceptible to black dot in 2010 than in 2009, when compared with the susceptible reference varieties, and Chaski was less susceptible to silver scurf in 2010 than 2009. 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. In 2010, the methodology for silver scurf was changed after research results indicated infesting compost gave greater and earlier development of symptoms than dipping seed tubers in a macerated suspension of spores and mycelia. However, as Table 6 shows, there was generally less disease severity in 2010 when using this new method. However, this may have been due to environmental pressures limiting disease development in that year.

The testing has also identified some varieties that have a greater degree of resistance than the existing reference varieties. For example, Lanorma was consistently more resistant to silver scurf than the resistant reference variety Romano, scoring 8.9 compared with 7.6, and consideration may need to be given on its inclusion as a resistant reference variety.

Sarpo Mira was by far the most resistant variety in 2009 and 2010 under foliage blight tests. However, it proved susceptible to tuber blight in both years only scoring 2.7, which was more susceptible than either susceptible reference variety (Cara or Valor). Such differences in reaction between foliage and tuber have been recorded in previous testing and confirm the necessity to ensure that more than one resistant variety is included in the test programme.

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 six 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. Users of this data should bear in mind that the final rating of a variety should 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 variety information immediately from various trials as soon as it is finalised. To date, the database has been accessed 117,317 times up to June 2010.

The 15 varieties which completed IVT in 2010 were Emblem, Crisps4All, Red Robin, Golden Nugget, Apache, Divaa, Trixie, Chaski, Paru, Chicago, Sarpo Gwyn, Lanorma,

Nectar, Amora and Challenger. In summary, the key findings for these varieties are as follows:

#### **Emblem (12-04)**

Resistant to: **skin spot, dry rot – *F. coeruleum*, external damage and PCN Ro1.**  
Susceptible to: **tuber late blight and PCN Pa 2/3 and 1.**

#### **Crisps4All**

Resistant to: **silver scurf, external damage, internal damage and PCN Ro1.**  
Susceptible to: **black dot, tuber late blight, blackleg and powdery scab.**

#### **Red Robin**

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

#### **Golden Nugget (47 C8R04)**

Resistant to: **skin spot, powdery scab, dry rot – *F. coeruleum* and *F. sulphureum* and external damage.**  
Susceptible to: **foliage late blight, silver scurf and tuber late blight.**

#### **Apache (150 PS 05)**

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

#### **Divaa (CA 99-1)**

Resistant to: **dry rot – *F. coeruleum* and external damage.**  
Susceptible to: **tuber late blight, powdery scab, dry rot - *F. sulphureum* and PCN Ro1.**

#### **Trixie\_(00Z302A8)**

Resistant to: **skin spot, common scab and dry rot – *F. coeruleum*.**  
Susceptible to: **tuber late blight, dry rot - *F. sulphureum*, PCN Ro1 and PCN Pa 2/3 and 1.**

#### **Chaski (99H44B3)**

Resistant to: **blackleg, powdery scab, common scab and external damage.**  
Susceptible to: **tuber late blight, dry rot – *F. coeruleum* and *F. sulphureum*, PCN Ro1 and PCN Pa 2/3 and 1.**

#### **Paru (99H56B2)**

Resistant to: **foliage late blight, silver scurf, skin spot, blackleg, powdery scab, common scab, dry rot – *F. coeruleum* and external damage.**  
Susceptible to: **tuber late blight, dry rot - *F. sulphureum*, PCN Ro1 and PCN Pa 2/3 and 1.**

#### **Chicago (98C051-002)**

Resistant to: **dry rot – *F. coeruleum* and *F. sulphureum*, external damage and PCN Ro1**

### **Sarpo Gwyn (96136A)**

Resistant to: **silver scurf, skin spot, external damage and PCN Ro1.**

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

### **Lanorma**

Resistant to: **silver scurf, skin spot, common scab, dry rot – *F. coeruleum*, and PCN Ro1.**

Susceptible to: **tuber late blight and dry rot - *F. sulphureum*.**

### **Nectar**

Resistant to: **silver scurf.**

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

### **Challenger**

Resistant to: *silver scurf, skin spot, common scab, and dry rot - *F. sulphureum** Susceptible to: **PCN Ro1 and PCN Pa 2/3 and 1.**

### **Amora**

Resistant to: **skin spot, dry rot – *F. coeruleum*, external damage and PCN Ro1.**

Susceptible to: **blackleg, powdery scab, internal damage and PCN Pa 2/3 and 1.**

### **Victoria**

Resistant to: **silver scurf, skin spot and dry rot - *F. coeruleum*.**

Susceptible to: *dry rot - *F. sulphureum*.*

### **Axona.**

Resistant to: *silver scurf.*

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

### **Linton**

Resistant to: **blackleg and PCN Ro1.**

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

### **SM-01-81-01**

Resistant to: *silver scurf, dry rot – *F. coeruleum* and *F. sulphureum*, external damage and PCN Ro1.*

Susceptible to: **tuber late blight, and internal damage.**

### **Tresdale**

Resistant to: *silver scurf, skin spot, blackleg and external damage.*

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

### **Clevna**

Resistant to: *skin spot, blackleg, dry rot - *F. coeruleum* and external damage.*

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

### **Orwell**

Resistant to: *silver scurf and blackleg.*

Susceptible to: *foliage late blight, tuber late blight, powdery scab, PCN Pa 2/3 and Ro1.*

### **Lionheart (99C115-002)**

Resistant to: *silver scurf*, *skin spot* and **dry rot** – *F. coeruleum*.

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

### **Pioneer**

Resistant to: *silver scurf*, **blackleg**, **powdery scab**, **common scab** and PCN Ro1.

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

### **Safari**

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

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

### **Ramos**

Resistant to: *silver scurf*, *dry rot* – *F. coeruleum*, and PCN Ro1.

Susceptible to: *tuber late blight*.

### **Orchestra**

Resistant to: *silver scurf*, *powdery scab*, *common scab* and PCN Ro1.

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

### **Mustang**

Resistant to: *silver scurf*, *skin spot*, *dry rot* – *F. coeruleum*, *external damage*, *internal damage* and PCN Ro1.

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

### **Chopin**

Resistant to: *blackleg*, **PCN Ro1**, *internal damage* and *external damage*.

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

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