Research Report

Independent Variety Trials 2006

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1.1 Contents

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, the 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, potato varieties on the Common Catalogue which are being developed for GB production were 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 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.

1.2 Work Undertaken and Findings

In 2006, tests were conducted on 4 varieties undergoing their 2nd year of UK NL testing, 7 varieties which had completed UK NL tests and 9 Common Catalogue varieties (see Table 2). SASA conducted a test to determine susceptibility to foliage late blight at a site near Ayr. 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. Table 1 summarises the test results for 2005-06 but ratings shown in italic font are based on one year's test results and should be regarded as provisional.

Table 1. Summary of varietal ratings (1=low, 9=high) for resistance to diseases, pests and defects (provisional ratings are shown in italics, final ratings are in bold).

	Annabelle	Almera	Arrow	Elisabeth	Vivaldi	Fontane	Saphire	Sassy	Lady Claire	Gemson	TX 15231	Sparkle	Vales Rustic	Mayan Gold	Harmony	Sunrise	Pixie	Vales Emerald	Vales Everest	Vales Soverign
Maturity	1E	2E	1E	1E	EM	EM	EM	M	M	2E	EM	LM	2E	LM	EM	2E	2E	1E	LM	M
Foliage late blight (field)	**2**	**2**	**3**	**3**	**3**	*2*	*4*	*3*	*2*	*2*	*2*	*7*	*2*	*7*	*2*	**3**	**3**	**3**	**4**	**5**
Black dot	**9**	**1**	**6**	**5**	**7**	*4*	*9*	*8*	*1*	*9*	*6*	*9*	*9*	*9*	*9*	**3**	**1**	**1**	**2**	**8**
Black scurf	**7**	**6**	**9**	**7**	**5**	*9*	*1*	*3*	*6*	*4*	*1*	*7*	*4*	*9*	*7*	**6**	**3**	**4**	**8**	**6**
Silver scurf	**8**	**7**	**7**	**5**	**6**	*5*	*7*	*8*	*3*	*7*	*8*	*7*	*9*	*6*	*3*	**8**	**5**	**5**	**5**	**6**
Skin spot	**7**	**7**	**6**	**6**	**5**	*7*	*5*	*7*	*7*	*5*	*2*	*7*	*7*	*7*	*7*	**7**	**6**	**5**	**5**	**3**
Foliage late blight (lab)	**3**	**3**	**5**	**4**	**4**	nt	nt	nt	nt	**4**	**5**	**5**	**3**	**4**	**6**	**4**	**4**	**4**	**5**	**6**
Tuber late blight*	**1**	**3**	**4**	**1**	**5**	*5*	*4*	*4*	*3*	**2**	**1**	**4**	**3**	**4**	**3**	**3**	**5**	**4**	**4**	**3**
Blackleg- *Pectobacterium atrosepticum*	**6**	**5**	**4**	**7**	**4**	*3*	*9*	*9*	*4*	**8**	**6**	**6**	**4**	**5**	**3**	**2**	**8**	**7**	**4**	**8**
Powdery scab	**5**	**2**	**5**	**6**	**6**	*6*	*6*	*8*	*6*	**7**	**6**	**4**	**7**	**8**	**2**	**2**	**8**	**7**	**6**	**3**
Common scab	**6**	**4**	**5**	**4**	**5**	*4*	*6*	*2*	*5*	**5**	**5**	**4**	**5**	**8**	**6**	**7**	**4**	**4**	**4**	**7**
Dry rot – *Fusarium coeruleum*	**6**	**6**	**3**	**7**	**6**	*6*	*6*	*5*	*6*	**3**	**6**	**6**	**4**	*5*	*5*	**7**	**5**	**3**	**5**	*6*
Dry rot – *Fusarium sulphureum*	**5**	**3**	**4**	**6**	**1**	*5*	*4*	*6*	*6*	**2**	**7**	**3**	**1**	*1*	*4*	**6**	**6**	**3**	**2**	*6*
PCN Ro-1	**9**	**9**	**9**	**9**	**2**	*9*	*4*	*9*	*9*	**2**	**3**	**9**	**2**	**1**	**5**	**3**	**8**	**2**	**5**	**9**
PCN Pa 2/3	**2**	**2**	**3**	**2**	**3**	*2*	*4*	*4*	*3*	**2**	**2**	**4**	**2**	**2**	**4**	**3**	**3**	**2**	**6**	**2**
External damage	**3**	**5**	**4**	**4**	**6**	*6*	*6*	*6*	*6*	**6**	**4**	**5**	**5**	**6**	**6**	**5**	**9**	**7**	**7**	**4**
Internal damage	**7**	**4**	**6**	**6**	**4**	*4*	*6*	*3*	*4*	**3**	**2**	**5**	**3**	**6**	**7**	**2**	**5**	**6**	**4**	**6**

*1st early Varieties and 2nd early/maincrop varieties were assessed separately and scores should not be compared.

nt = Not tested

1.3 Conclusions

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

Gemson

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

Susceptible to: foliage and **tuber late blight**, **dry rot- *F. coeruleum and F. sulphureum*, internal damage**, **PCN Ro1, Pa2/3 and 1.**

Mayan Gold

Resistant to: foliage late blight, black dot, black scurf, skin spot, **powdery and common scab**

Susceptible to: dry rot– *F. sulphureum*, **PCN Ro1, Pa2/3 and 1**

Harmony

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

Susceptible to: foliage and **tuber late blight,** silver scurf, **blackleg and powdery scab**

Sunrise

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

Susceptible to: **foliage and tuber late blight, black dot**, **blackleg, powdery scab, internal damage, PCN Ro1 and Pa 2/3 and 1**

Pixie

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

Susceptible to: **foliage late blight, black scurf, black dot and PCN Pa 2/3 and 1**

TX 15231

Resistant to: silver scurf and **dry rot– *F. sulphureum***

Susceptible to: foliage and **tuber late blight**, black scurf, skin spot, **internal damage, PCN Ro1, Pa 2/3 and 1.**

Sparkle

Resistant to: foliage late blight, black dot, black scurf, silver scurf, skin spot and **PCN Ro1**

Susceptible to: **dry rot– F. sulphureum,**

Vales Emerald

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

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

Vales Everest

Resistant to: **black scurf, external damage and PCN Pa 2/3 and 1.**

Susceptible to: **dry rot- *F. sulphureum* and black dot.**

Vales Rustic

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

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

Vales Sovereign

Resistant to: **black dot, blackleg, common scab and PCN Ro1**

Susceptible to: **skin spot, tuber late blight, powdery scab, PCN Pa2/3, and 1**

Annabelle

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

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

Almera

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

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

Arrow

Resistant to: **black scurf, silver scurf** and **PCN Ro1**

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

Elisabeth

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

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

Vivaldi

Resistant to: **black dot.**

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

Fontane

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

Susceptible to: foliage late blight, blackleg and **PCN Pa2/3 and 1**

Saphire

Resistant to: black dot, silver scurf and blackleg

Susceptible to: black scurf

Lady Claire

Resistant to: skin spot and **PCN Ro1**

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

Sassy

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

Susceptible to: foliage late blight, black scurf, common scab and internal damage

In addition, a 3rd year of testing for some varieties resulted in final ratings as follows:

black scurf: Bambino = **7**, 86F-2.3 = **9**

silver scurf: Bambino = **2**, Bonnie = **7**

2. EXPERIMENTAL REPORT

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^o, 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. This report summarises the testing conducted over the 2006-2007 season.

2.2 MATERIALS AND METHODS

2.2.1. Standard Varieties

The standard varieties used in 2005 were reviewed and retained for the 2006 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, 2005 :

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 BPC, of 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, 4 new Common Catalogue varieties were identified for inclusion in the test programme.

Table 2. Varieties in IVT in 2006

Variety	Breeder/Agent	Maturity	Stage of testing prior to 2006	
			NL	IVT
UK National List				
Bonnie	Cygnet PB	Maincrop	Completed	Silver scurf retest year 3
Bambino	Cygnet PB	Maincrop	Completed	Black scurf & silver scurf retest year 3
Pixie	Doig	E. Maincrop	Completed	1
Sunrise	Doig	Maincrop	Completed	1
Vales Emerald	SCRI/Greenvale	1st Early	Completed	1
Vales Everest	SCRI/Greenvale	Maincrop	Completed	1
Vales Sovereign	SCRI/Greenvale	Maincrop	Completed	1
Harmony	Caithness PB	E. Maincrop	Completed	-
Mayan Gold	SCRI/Greenvale	L. Maincrop	Completed	-
TX 15231	Pseedco Ltd	E. Maincrop	1	-
Gemson	Grampian Growers	2nd Early	1	-
Vales Rustic	SCRI/Greenvale	2nd Early	1	-
Sparkle	NIHPBS	L Maincrop	1	-
86F-2.3	Higgins Agriculture	E. Maincrop	1	Black scurf retest year 3
Common Catalogue				
Annabelle	HZPC	1st Early	-	1
Vivaldi	HZPC	E. Maincrop	-	1
Arrow	Agrico	1st Early	-	1
Almera	Agrico	E. Maincrop	-	1
Elisabeth	Agrico	1st Early	-	1
Fontane	Agrico	E. Maincrop	-	-
Lady Claire	MBMG	Maincrop	-	-
Saphire	MBMG	E. Maincrop	-	-
Sassy	MBMG	Maincrop	-	-

Susceptibility tests for dry rot (*F. solani* var. *coeruleum* and *F.sulphureum*) were also conducted on the following NL varieties because they had not been tested under the previous NL programme: Sunrise, Pixie, Vales Emerald, Vales Everest, Vales Sovereign, Harmony and Mayan Gold.

86.F.2-3 and Bambino were also tested for susceptibility to black scurf for a third year because of variable results over 2 years of testing. As a plant health precaution, all seed tubers from non-Scottish sources were tested for brown rot (*Ralstonia solanacearum*) and

ring rot (*Clavibacter michiganensis* subsp. *sepodonicus*). Delay in completing this testing meant that 2 separate powdery scab trials were conducted, one with NL entries and one with Common Catalogue entries.

2.2.3 IVT Test Methods

The test methods used were those agreed and set out in the standard protocols prepared for the 2005 programme. Details of the tests are provided below:

2.2.3.1 **Foliage late blight in the field, 2006**: the test tubers were planted in plots of 2 tubers at Dalrymple, by Ayr. The 2nd early/maincrop experiment was planted on 9 May and 1st early experiment on 2 June. 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 (1.2.3.4.6.7.8.10.11) of *P. infestans* were laid out along the adjacent rows of King Edward on 6 July. On 24 July, 1 August, 8 August and 15 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.

2.2.3.2 **Skin spot, 2006:** 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. Pots were placed outdoors in peat beds on 16 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 18 August at the half the manufacturer's recommended rate. The tubers were then stored in cardboard boxes at 5-8^{0}C until the last week in February. The % surface area affected by skin spot was recorded in 5 categories.

2.2.3.3 **Silver scurf, 2006:** 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 18 May. The layout was a randomised block design with 6 replications. Haulms were allowed to senesce naturally. Tubers were harvested on 13-14 September. The produce of each pot was placed in separate cardboard box and incubated at 12-15ºC and high humidity until silver scurf lesions had developed sufficiently on the

susceptible standard varieties. In 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, 2006:** Petri dishes containing potato dextrose agar (PDA) were inoculated with three isolates of *C. coccodes*. When, after one week, 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 30 May in 15 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 24 October.

2.2.3.5 **Black scurf, 2006:** Petri dishes containing PDA were inoculated with three isolates of *R. solani* AG-3. When, after 1 week, 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 2 June, a single seed tuber of each variety was planted in a 15 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 20 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 8 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". The methods are summarised below:

Tuber late blight: the rose-end of field-grown tubers is sprayed with a known R-gene complex isolate(s) 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^{0}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^{o}C and the incidence of splitting at the point of impact is recorded. Tubers for the bruising test are stored at 9-11^{o}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. Over-trial variety means were calculated using REML from transformed trial means and 1-9 ratings derived by linear interpolation using varieties with known consistent susceptible and resistant reactions as fixed reference points.

2.3 RESULTS

2.3.1 IVT Tests

2.3.1.1 Foliage late blight (field)

2.3.1.1.1 Summary of 2005/06 Trials (Table 3)

The AUDPC values were lower in 2006 than in 2005, reflecting the slower development of late blight because of the drier weather conditions in 2006. In the 1st Early trial, Orla was apparently more susceptible in 2006 than in 2005. All the 1st Early test varieties were susceptible with Annabelle being most susceptible. In the 2nd Early/Maincrop trial, all test varieties were susceptible except for Vales Sovereign which scored 5. Although Cara and Stirling reacted similarly in 2006, Cara was more susceptible than Stirling in 2005 even although the same isolate was used in both years. In the 2004 test at Cambridge, Cara was more resistant than Stirling. The susceptible ratings for Annabelle, Almera and Vivaldi in these tests are in agreement with the ratings published by NIVAA from Dutch tests (www.nivaa.nl).

2.3.1.1.2 2006 Trial (Table 3)

Most of first year varieties were fairly susceptible to late blight, scoring between 2 and 4. Sparkle and Mayan Gold showed good resistance, being as resistant as Stirling and Cara. In the official NL tests, these varieties scored 5 and 4 respectively. By contrast, Harmony appeared to be susceptible in the field but was scored as 6 in NL tests.

Table 3. Mean % (angular transformation) Area under Disease Progress in foliage late blight field test over 2 years (final rating in bold).

Variety	Test Year 2005	2006	1-9 rating
1st Early			
Home Guard	81.0	34.9	**3**
Orla	24.5	30.4	**6**
Annnabelle	86.8	46.7	**2**
Arrow	76.0	42.4	**3**
Elisabeth	85.3	33.8	**3**
Vales Emerald	74.6	38.3	**3**
LSD (P<0.05)	6.0	5.6	
2nd Early & Maincrop			
Bintje	84.4 (58.8)*	40.5	**3**
Russet Burbank	81.6	39.6	**3**
Cara	48.9 (16.3)*	19.8	**7**
Stirling	17.2 (42.8)*	15.5	**7**
Almera	86.8	47.0	**2**
Vivaldi	82.7	42.7	**3**
Sunrise	80.2	36.2	**3**
Pixie	74.2	39.7	**3**
Vales Everest	69.9	31.6	**4**
Vales Sovereign	- (36.7)*	25.8	**5**
Fontane		46.1	*2*
Saphire		33.4	*4*
Lady Claire		49.5	*2*
Sassy		43.2	*3*
TX 15231		47.6	*2*
Gemson		46.0	*2*
Vales Rustic		48.7	*2*
Sparkle		16.2	*7*
Harmony		44.8	*2*
Mayan Gold		16.4	*7*
LSD (P<0.05)	6.0	5.6	

* 2004 Cambridge result

2.3.1.2. **Black scurf**

2.3.1.2.1 Summary of 2005/2006 Trials (Table 4)

The ratings for the standard varieties were in general agreement with their ratings determined by previous tests. There was a reasonably close relationship between the 2005 and 2006 results, with the exception of Vales Emerald which was very susceptible in 2005 but moderately resistant in 2006 test. The least significant difference (LSD) values for 2005 and 2006 tests were similar, in contrast to that for 2004 Cambridge test which was approximately twice that for the tests in the following 2 years. The results for Bambino and 86-F-2.3 differed over the 3 years. Both varieties were more resistant in 2005 and 2006 than in 2004.

Table 4. Mean % (angular transformation) surface area affected by black scurf

	Test Year		
Variety	**2005**	**2006**	**1-9 rating**
Sante (3)#	11.9 (17.3)*	11.4	**3**
Duke of York (5)	9.2	10.6	**6**
Saxon (5)	12.1(20.6)*	10.1	**4**
King Edward (6)	12.0	9.4	**5**
Cara (7)	8.9	9.7	**6**
Lady Christ (8)	7.4	8.4	**8**
86-F-2.3	6.0 (21.5)*	6.7	**9**
Almera	8.9	10.1	**6**
Annabelle	10.7	6.2	**7**
Arrow	6.6	6.6	**9**
Elisabeth	9.0	9.2	**7**
Vivaldi	10.1	9.8	**5**
Bambino	9.3 (17.3)*	8.6	**7**
Pixie	13.3	10.1	**3**
Sunrise	10.5	8.8	**6**
Vales Emerald	15.0	7.7	**4**
Vales Everest	8.5	7.7	**8**
Vales Sovereign	-(20.3)*	6.7	**6**
Fontane		8.0	*9*
Saphire		11.5	*1*
Lady Claire		9.5	*6*
Sassy		10.7	*3*
TX 15231		12.4	*1*
Gemson		10.5	*4*
Vales Rustic		10.2	*4*
Sparkle		8.7	*7*
Harmony		8.8	*7*
Mayan Gold		7.3	*9*
LSD (P<0.05)	2.8	2.1	

- * 2004 Cambridge result
- # rating as published in NIAB Pocket Guide of Varieties of potato, 2005

2.3.1.2.2 2006 Trial (Table 4)

The amount of disease developing on the control varieties in 2006 was similar to that in 2005. Of the 1st year varieties, Saphire and TX 15231 appeared to be very susceptible to black scurf. Mayan Gold and Fontane were very resistant, scoring 9 and Sparkle and Harmony were also resistant scoring 7.

2.3.1.3. **Black dot**

2.3.1.3.1 Summary of 2005/2006 Trials (Table 5)

Overall, the final scores for the standard varieties were in good agreement with their published ratings. Cara appeared to be more resistant in 2005 and 2006 tests than indicated by the published rating. Of the candidate varieties, Almera, Pixie, Vales Emerald and Vales Everest appeared to be very susceptible to block dot whereas Annabelle, Vivaldi and Vales Sovereign were very resistant.

2.3.1.3.2 2006 Test (Table 5)

The amount of disease was very similar in the 2 years of testing. Of the ten 1st year varieties tested, seven were very resistant to black dot and one, Lady Claire appeared to be very susceptible.

Table 5. Mean % (angular transformation) surface area affected by black dot

Variety	Test Year 2005	2006	1-9 rating
Lady Christl (2)[#]	41.7	45.3	**2**
Pentland Squire (3)	41.5 (52.0)[*]	43.2	**3**
Fianna (5)	36.7 (50.7)[*]	39.2	**4**
Cara (6)	35.3	22.5	**8**
Saxon (7)	22.3 (49.3)[*]	36.6	**7**
Almera	42.7	46.2	**1**
Annabelle	10.6	12.4	**9**
Arrow	29.4	35.7	**6**
Elisabeth	41.2	31.6	**5**
Vivaldi	15.3	46.3	**7**
Pixie	45.4	43.5	**1**
Sunrise	33.4	45.3	**3**
Vales Emerald	46.6	49.2	**1**
Vales Everest	44.9	38.3	**2**
Vales Sovereign	(47.4)[*]	27.4	**8**
Fontane		41.6	*4*
Saphire		30.7	*9*
Lady Claire		46.9	*1*
Sassy		34.9	*8*
TX 15231		38.1	*6*
Gemson		33.1	*9*
Vales Rustic		27.2	*9*
Sparkle		24.3	*9*
Harmony		29.3	*9*
Mayan Gold		27.6	*9*
LSD (P<0.05)	10.2	11.4	

* 2004 Cambridge result

[#]rating of the variety as published in NIAB Pocket Guide to Varieties of Potatoes, 2005

2.3.1.4. **Silver scurf**

2.3.1.4.1 Summary of 2005/2006 Trials (Table 6)

Apart from Romano, the ratings for the standard varieties were in good agreement with published ratings. Five out of 12 candidate varieties were relatively resistant, scoring 7 or greater. None of the candidates were as susceptible as Lady Christl. Bambino was more susceptible in 2005 and 2006 tests than in 2004 test whereas the

reverse occurred with Bonnie which was more resistant in 2005 and 2006 than in 2004. The final ratings for these 2 varieties were calculated only using 2005 and 2006 data.

Table 6. Mean % (angular transformation) surface are affected by silver scurf

	Test Year		
Variety	**2005**	**2006**	**1-9 rating**
Lady Christl (2)[#]	50.4	38.3	**2**
Pentland Squire (3)	40.2 (52.8)[*]	36.0	**4**
Romano (4)	31.4 (37.4)[*]	13.8	**8**
Fianna (5)	50.4 (47.8)[*]	21.2	**4**
Saxon (5)	48.9 (40.2)[*]	26.5	**4**
Cara (7)	34.5 (43.8)[*]	18.0	**7**
Almera	32.4	21.6	**7**
Annabelle	36.9	15.6	**7**
Arrow	37.7	18.3	**7**
Elisabeth	41.3	29.8	**4**
Vivaldi	39.9	25.3	**5**
Sunrise	31.4	21.4	**7**
Pixie	41.4	31.2	**4**
Vales Emerald	52.5	14.5	**5**
Vales Everest	45.3	26.0	**4**
Vales Sovereign	- (42.5)[*]	22.0	**6**
Bambino	50.4 (42.8)[*]	34.7	**2**
Bonnie	37.3 (40.4)[*]	18.1	**7**
Fontane		24.5	*5*
Saphire		17.4	*7*
Lady Claire		35.0	*3*
Sassy		14.4	*8*
TX 15231		12.3	*8*
Gemson		17.5	*7*
Vales Rustic		8.4	*9*
Sparkle		19.7	*7*
Harmony		34.1	*3*
Mayan Gold		20.5	*6*
LSD (P<0.05)	10.3	8.1	

* 2004 Cambridge result

[#]rating of the variety as published in NIAB Pocket Guide to Varieties of Potatoes, 2005

2.3.1.4.2 2006 test (Table 6)

The severity of silver scurf was somewhat less in 2006 than in 2005; however, expression of the symptom was more distinct with fewer other diseases being present to affect the assessment. Of the varieties in the 1st year of testing, six appeared to be relatively resistant scoring 7 or greater and only Harmony and Lady Claire appeared to show a degree of susceptibility.

2.3.1.5. **Skin spot**

2.3.1.5.1 Summary of 2005/2006 Trials (Table 7)

The severity of skin spot and least significant difference values were similar in both years. Almera, Annabelle and Sunrise were resistant to skin spot, scoring 7. None of the varieties tested in 2005 and 2006 were susceptible. Vales Sovereign scored a 3, being as susceptible as Pentland Squire in 2004 Cambridge test and relatively resistant in 2006 test.

2.3.1.5.2 2006 Test (Table 7)

Of the 1st year candidate varieties, most appeared to be resistant to some extent, except for TX 15231 which scored 2.

Table 7. Mean % (angular transformation) surface area affected by skin spot.

	Test Year		
Variety	**2005**	**2006**	**1-9 rating**
Pentland Squire (2)[#]	16.3 (19.1)[*]	11.4	**3**
King Edward (3)	10.0 (6.7)[*]	6.6	**5**
Sante (3)	9.8	11.8	**3**
Saxon (6)	7.1 (3.8)[*]	7.3	**6**
Romano (7)	2.2 (4.0)[*]	0.5	**7**
Fianna (8)	2.2 (0.2)[*]	1.2	**7**
Almera	0.6	.0.8	**7**
Annabelle	0.5	0	**7**
Arrow	1.2	4.0	**6**
Elisabeth	2.8	5.8	**6**
Vivaldi	1.0	10.1	**5**
Sunrise	2.3	0.7	**7**
Pixie	4.4	6.0	**6**
Vales Emerald	7.4	5.1	**5**
Vales Everest	7.3	6.0	**5**
Vales Sovereign	- (27.7)[*]	5.6	**3**
Fontane		1.3	*7*
Saphire		7.5	*5*
Lady Claire		1.7	*7*
Sassy		0.7	*7*
TX 15231		13.8	*2*
Gemson		5.9	*5*
Vales Rustic		0.6	*7*
Sparkle		0.4	*7*
Harmony		0	*7*
Mayan Gold		0	*7*
LSD (P<0.05)	4.6	4.3	

* 2004 Cambridge result

[#]rating of the variety as published in NIAB Pocket Guide to Varieties of Potatoes, 2005

2.3.2. NL Tests

2.3.2.1 **Tuber late blight** (Table 8)

Separate tests were conducted for 1st early and for 2nd early/maincrop varieties in order to ensure that the testing was conducted at an appropriate stage of tuber development and covered a range of tuber maturity. In the 1st early trial, Home Guard was susceptible and Orla was resistant, rated as 7 (Table 8). Of the test varieties, Elisabeth and Annabelle were very susceptible and Arrow was only slightly less

susceptible than Home Guard. In the 2nd early/maincrop trial, Vivaldi showed moderate resistance, scoring 5 and Gemson and TX 15231 were susceptible. According to NIVAA data, Annabelle and Almera show "moderately good resistance to tuber late blight and Vivaldi shows "rather good resistance". In all cases, our results differ from these assessments rating the varieties more susceptible. Of the four 1st year Common Catalogue varieties, Fontane appeared to be the most resistant, scoring 5 and Lady Claire was the most susceptible, scoring 3.

Table 8. Mean % (angular transformation) tubers affected by late blight

Variety	2006	Overall Mean	1-9 rating
Home Guard	78.4	65.6	**2**
Orla	25.6	17.4	**7**
Stirling	24.7	12.3	**8**
Arrow	63.8	54.6	**4**
Elisabeth	90.0	90.0	**1**
Annabelle	83.6	75.6	**1**
LSD P<0.05	10.6	18.4	-
Bintje	83.0	78.9	**2**
Stirling	3.1	3.2	**8**
Almera	73.4	64.6	**3**
Vivaldi	60.5	42.0	**5**
TX 15231	90.0	88.4	**1**
Gemson	86.8	77.7	**2**
Vales Rustic	86.8	65.6	**3**
Sparkle	36.6	47.4	**4**
Fontane	48.4	-	*5*
Saphire	55.5	-	*4*
Lady Claire	75.6	-	*3*
Sassy	61.6	-	*4*
LSD (P<0.05)	41.6	18.4	-

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

The incidence of plants affected by blackleg was greater in 2006 than in 2005. There was a clear difference between the susceptible and resistant standard varieties. Both Cultra and Ailsa were rated as 8 over 2 years of testing and the standard varieties Concurrent, Estima, and Morene were rated as susceptible to varying degrees, scoring 3, 4 and 5 respectively. Of the varieties completing testing, Gemson and Elisabeth were most resistant followed by Sparkle and TX 15231. After one year of testing, Fontane appeared to be the most susceptible of Common Catalogue varieties. Saphire and Sassy appeared to be very resistant.

Table 9. Mean % (angular transformation) plants affected by blackleg (*Pectobacterium atrosepticum)*

Variety	**2006**	**Overall Mean**	**1-9 rating**
Concurrent	90.0	65.0	**3**
Estima	70.4	55.8	**4**
Morene	53.1	44.9	**5**
Cultra	40.1	20.4	**8**
Ailsa	17.9	16.8	**8**
Arrow	83.4	58.1	**4**
Annabelle	31.5	31.4	**6**
Elisabeth	40.6	27.3	**7**
Almera	66.4	46.9	**5**
Vivaldi	85.4	60.0	**4**
TX 15231	36.9	35.3	**6**
Gemson	13.3	13.5	**8**
Vales Rustic	80.8	58.9	**4**
Sparkle	62.1	37.3	**6**
Fontane	85.4	-	*3*
Saphire	15.9	-	*9*
Lady Claire	80.8	-	*4*
Sassy	0	-	*9*
LSD (P<0.05)	16.7	22.6	

2.3.2.3 **Common Scab** (Table 10)

The severity of common scab was slightly greater in 2006 than in 2005 and this was reflected in a slightly higher LSD value. The most susceptible of the standard varieties was Maris Piper rated as 2 and the most resistant was Pentland Crown rated as 7. All of the varieties completing testing were intermediate in their reaction, none being as susceptible as Maris Piper or as resistant as Pentland Crown. Of the varieties in 1st year of testing, Sassy appeared to be almost as susceptible as Maris Piper. The NIVAA ratings for Annabelle, Almera and Vivaldi are "rather susceptible". Our tests indicate that all 3 varieties are more resistant than this rating. This difference may be attributed to the range of common scab causing species of *Streptomyces* to which the test varieties have been exposed. It has been shown that *Streptomyces* species other than *scabiei* may cause common scab in Europe e.g. s*telliscabiei* and, if Dutch tests are conducted in naturally infected soils, then test varieties may have been exposed to a wider range of pathogens than in our test using an isolate of *S. scabiei*.

Table 10. Mean % (angular transformation) surface area affected by common scab

Variety	2006	Overall Mean	1-9 rating
Maris Peer	13.5	22.1	**5**
Estima	11.0	20.9	**5**
Maris Bard	28.0	28.8	**4**
Home Guard	13.7	18.0	**6**
Maris Piper	37.9	37.3	**2**
Desiree	25.6	29.5	**3**
Pentland Crown	12.9	11.0	**7**
Arrow	9.7	19.0	**5**
Annabelle	11.5	17.3	**6**
Elisabeth	23.6	27.6	**4**
Almera	19.7	24.2	**4**
Vivaldi	21.1	23.3	**5**
TX 15231	15.9	21.9	**5**
Gemson	25.4	23.6	**5**
Vales Rustic	9.6	19.3	**5**
Sparkle (	27.1	28.9	**4**
Fontane	23.9	-	*4*
Saphire	13.6	-	*6*
Lady Claire	17.4	-	*5*
Sassy	30.8	-	*2*
LSD (P<0.05)	9.7	2.2	

2.3.2.4 **Powdery Scab** (Table 11)

The severity of disease and the ranking of the standard varieties were in close agreement in the two tests conducted in 2006. The LSD values for these 2 tests and for 2005 test were also very similar. However, Accent in 2006 was much more resistant than in 2004 and 2005 tests at SASA when it reacted as susceptibly as Estima. Accent's reaction in 2006 was closer to the rating of 6 in NIAB Pocket Guide to Varieties of Potatoes. Of the varieties completing the 2 year test programme, Almera scoring 2 and Sparkle scoring 4 were the most susceptible. The remaining varieties were resistant to some degree, with Gemson and Vales Rustic scoring 7 being the most resistant. The four 1st year Common Catalogue varieties all appeared to be relatively resistant. There was some evidence that Annabelle and Arrow may be susceptible to cankerous powdery scab (data not shown).

Table 11. Mean % (angular transformation) surface area affected by powdery scab

Variety	2006	Overall Mean	1-9 rating
Accent	11.4	26.4	**4**
Estima	30.5	31.1	**3**
Cara	11.3	12.3	**7**
Pentland Crown	8.9	10.9	**7**
Sante	6.4	7.2	**8**
TX 15231	18.6	18.4	**6**
Gemson	9.4	11.6	**7**
Vales Rustic	9.9	12.4	**7**
Sparkle	28.2	24.8	**4**
LSD (P<0.05)	4.7	14.5	
Accent	12.0	26.7	**4**
Estima	32.1	31.9	**3**
Cara	9.6	11.5	**7**
Pentland Crown	10.3	11.6	**7**
Sante	7.8	7.9	**8**
Arrow	25.3	22.2	**5**
Annabelle	18.0	20.2	**5**
Elisabeth	13.0	17.8	**6**
Almera	45.1	38.6	**2**
Vivaldi	15.7	16.4	**6**
Fontane	15.6		*6*
Saphire	19.8		*6*
Lady Claire	18.3		*6*
Sassy	7.3		*8*
LSD (P<0.05)	6.4	17.8	-

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 was generally less in 2006 than in 2005. The reaction of Pentland Squire, Nadine and Sante was in agreement with published ratings. The suceptible reaction of Catriona was in line with its known reaction in practice. Estima appeared to be more resistant in 2006 test than in 2005. Sante was the most resistant of the standard varieties, rated as 6. Of the varieties completing testing, Arrow, Gemson and Vales Emerald were as susceptible as Pentland Squire. Six out of these 13 varieties were, however, at least as resistant as Sante. All of the 1st year varieties exhibited a good degree of resistance.

Table 12. Mean % (angular transformation) internal area affected by *Fusarium coeruleum*

Variety	2006	Overall Mean	1-9 rating
Pentland Squire	24.0	28.1	**3**
Catriona	45.1	39.8	**1**
Estima	6.0	15.9	**5**
Nadine	11.6	15.9	**5**
Sante	4.1	8.3	**6**
Arrow	41.8	29.8	**3**
Annabelle	5.5	8.7	**6**
Elisabeth	4.5	3.9	**7**
Almera	4.1	5.2	**6**
Vivaldi	4.5	8.3	**6**
TX 15231	4.5	11.3	**6**
Gemson	18.9	26.4	**3**
Vales Rustic	18.0	22.5	**4**
Sparkle	7.3	11.5	**6**
Fontane	4.5	-	*6*
Saphire	5.1	-	*6*
Lady Claire	4.1	-	*6*
Sassy	7.7	-	*5*
Sunrise	4.1	3.2	**7**
Pixie	7.0	12.4	**5**
Vales Emerald	17.1	29.5	**3**
Vales Everest	4.1	14.1	**5**
Vales Sovereign	7.2	-	*6*
Harmony	8.2	-	*5*
Mayan Gold	9.5	-	*5*
LSD (P<0.05)	4.7	17.0	

2.3.2.5.2 *F.sulphureum* (Table 13)

The amount of rotting in tubers of susceptible standard varieties was greater in 2006 than in 2005. Good discrimination was achieved amongst the standard varieties with Maris Piper being susceptible (2) and Saxon and Sante being resistant (6 and 7 respectively). TX 15231 was as resistant as Sante and Elisabeth, Sunrise and Pixie were as resistant as Saxon scoring 6. Vivaldi scored 1, and Gemson and Vales Everest were as susceptible as Maris Piper, scoring 2. Of the varieties in 1st year of testing, Mayan Gold appeared to be susceptible and Lady Claire, Sassy and Vales Sovereign appeared resistant.

Table 13. Mean % (angular transformation) internal area affected by *Fusarium sulphureum*

Variety	2006	Overall Mean	1-9 rating
Maris Piper	42.5	34.9	**2**
Atlantic	26.7	26.5	**4**
Nadine	29.9	22.6	**4**
Saxon	26.2	16.6	**6**
Sante	9.4	8.9	**7**
Arrow	20.4	22.0	**4**
Annabelle	30.0	21.4	**5**
Elisabeth	19.0	13.0	**6**
Almera	44.4	28.8	**3**
Vivaldi	50.5	39.6	**1**
TX 15231	4.5	6.7	**7**
Gemson	32.1	35.1	**2**
Vales Rustic	44.2	39.5	**1**
Sparkle	35.8	30.8	**3**
Fontane	20.5	-	*5*
Saphire	31.7	-	*4*
Lady Claire	15.2	-	*6*
Sassy	16.3	-	*6*
Sunrise	18.6	13.3	**6**
Pixie	18.4	14.1	**6**
Vales Emerald	41.7	27.9	**3**
Vales Everest	31.3	32.9	**2**
Vales Sovereign	12.9	-	*6*
Harmony	30.1	-	*4*
Mayan Gold	46.1	-	*1*
LSD (P<0.05)	6.8	19.3	

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

The incidence of splitting was broadly similar over the 2 test years. Ulster Sceptre (3) was the most susceptible of the 1st early varieties and Russet Burbank (4) was the most susceptible of the maincrop varieties. Annabelle was almost as susceptible as Ulster Sceptre. Vivaldi and Gemson were at least as resistant as Maris Piper and Record. All of the 1st year Common Catalogue varieties appeared to be resistant.

Table 14. Mean % (angular transformation) tubers affected by splitting after applying standard force

Variety	2006	Overall Mean	1-9 rating
Ulster Sceptre	34.0	43.0	**3**
Red Craigs Royal	18.0	19.0	**5**
Russet Burbank	26.5	30.3	**4**
Maris Peer	2.0	4.0	**6**
Record	0	1.0	**6**
Maris Piper	0	1.0	**6**
Arrow	18.0	33.5	**4**
Annabelle	46.2	38.1	**3**
Elisabeth	13.5	29.7	**4**
Almera	12.2	20.1	**5**
Vivaldi	2.0	1.0	**6**
TX 15231	38.8	23.4	**4**
Gemson	0	0	**6**
Vales Rustic	2.0	13.0	**5**
Sparkle	14.0	11.0	**5**
Fontane	2.0	-	*6*
Saphire	0	-	*6*
Lady Claire	0	-	*6*
Sassy	2.0	-	*6*
LSD (P<0.05)	-	23.2	-

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

The amount of bruising on the standard varieties was similar over the 2 years although the difference amongst the varieties was minimal. Five varieties scored 4 and two scored 6. TX 15231, Vales Rustic and Gemson were more susceptible to bruising than any of the standard varieties. Annabelle was the most resistant of all the varieties tested, including the standard varieties and this is in accordance with the NIVAA rating of "good resistance" for Annabelle. Although Almera was considered to have

"rather good resistance" by NIVAA, this was not supported in our tests in which the variety was scored as 4. Sassy appeared to be the most susceptible of the 1st year Common Catalogue varieties and Saphire the most resistant. However, such an assessment needs to be treated with particular 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	2006	Overall Mean	1-9 rating
Ulster Sceptre	6.3	6.2	4
Red Craigs Royal	4.9	6.2	4
Maris Peer	5.0	6.2	4
Record	5.6	6.7	4
Russet Burbank	5.1	6.4	4
Home Guard	4.4	4.2	6
Maris Piper	3.6	4.2	6
Arrow	4.7	4.4	6
Annabelle	3.7	3.3	7
Elisabeth	4.8	4.5	6
Almera	6.5	6.2	4
Vivaldi	5.2	5.9	4
TX 15231	7.4	8.2	2
Gemson	7.6	7.7	3
Vales Rustic	6.7	7.0	3
Sparkle	4.8	5.0	5
Fontane	5.2	-	*4*
Saphire	3.8	-	*6*
Lady Claire	5.4	-	*4*
Sassy	6.2	-	*3*
LSD (P<0.05)	-	1.7	-

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 Lady Claire, Sassy and Sparkle.

Three varieties expressed some resistance to Pa pathotypes but not the full resistance occurring with H1 gene for Ro1 which limits cyst multiplication to no more than the original population nor was the level of resistance as effective as that of Vales

Everest (6) which limited multilplication to 6% of that on the susceptible standard varieties, Desiree and Maris Piper.

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) †		
Desiree	2 (S)	2	
Maris Piper	9 (R)	2	
Fontane	9(R)	2	
Saphire	4(S)	4	
Lady Claire	9 (R)	3	
Sassy	9(R)	4	
Sparkle (L4729/1)	9 (R)	4	4

† 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. 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. However, it is not possible to carry out tests using reference varieties exhibiting the spectrum of resistance from highly susceptible to completely resistant, except for a few pests and diseases such as PCN Ro1. Ro 1 resistance is largely attributable to a major gene which results in no or minimal multiplication of the pest on the potato plant. However, for most other diseases and faults, all varieties can be affected to a greater or lesser extent. 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. This applies, in particular, to late blight, *Rhizoctonia solani* (the cause of stem canker and black scurf), silver scurf and black dot. 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.

A good spread of varietal reactions was achieved in the tests although, as recorded in previous reports (Kerr & Parish, 2005), some tests appeared to provide less discrimination amongst varieties than others e.g. black scurf, silver scurf. It is also important to note that there is a degree of variation from test to test in the reaction of any variety to a pathogen. The amount of variation differs from pathogen to pathogen. The final rating of a variety should, therefore be treated as a broad guide 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 are considered highly susceptible. Those with a score 4 or 5 are susceptible. Those with a score 6 or 7 are moderately resistant and those with scores 8 or 9 highly resistant.

It should be noted that pests and diseases are able to mutate and develop strains that can overcome the resistance of a variety. The standardised tests carried out to determine potato disease resistance ratings in the IVT programme use strains or isolates of pathogens that reflect the populations found in the UK. The tests cannot predict the development of resistance breaking strains and when using variety resistance as a control measure this fact should be borne in mind. Potential sources of variability may be illustrated by examining the results for foliage late blight tests. Over the 2 years, 8 varieties were tested by field method and by whole plant method used in NL testing (Table 1). The final rankings were in close agreement with only a 1 score difference except for Arrow which scored 5 in the field and 3 in the whole plant test. In all other comparisons, the rating in the whole plant test was slightly more susceptible than in the field test. Stewart *et al.*(1983) recorded a similar general correlation between field and glasshouse test but warned that susceptible varieties tended to be under-scored in the glasshouse test and resistant varieties over-scored. This indicates that the test using pot grown plants provides a reasonable estimation of varietal reaction in the field but not absolute agreement. Uncontrolled factors such as the amount of inoculum deposited on the test plants, maturity of the plant at the time of challenge by the pathogen may impact on the reaction of a variety in field testing. Environmental conditions during test year may also affect growth of plant and the number and length of periods favourable for infection. As noted earlier, Harmony appeared to be much more susceptible in the 2006 field

test than the rating of 6 obtained in NL tests in 1997 and 1998. This difference may be attributable to a difference in the virulence of the test isolate being used in the respective tests.

The 10 varieties which completed IVT in 2005 were Annabelle, Almera, Arrow, Elisabeth, Vivaldi, Sunrise, Pixie, Vales Emerald, Vales Sovereign and Vales Everest. In summary, the key findings for these varieties are as follows:

Annabelle

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

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

Almera

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

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

Arrow

Resistant to: black scurf, silver scurf and PCN Ro1

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

Elisabeth

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

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

Vivaldi

Resistant to: black dot.

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

Sunrise

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

Susceptible to: foliage and tuber late blight, black dot, blackleg, powdery scab, internal damage, PCN Ro1 and Pa 2/3 and 1

Pixie

Resistant to: blackleg, powdery scab, external damage and PCN Ro1.
Susceptible to: foliage late blight, black scurf, black dot and PCN Pa 2/3 and 1

Vales Emerald

Resistant to: blackleg, powdery scab and external damage.
Susceptible to: foliage late blight, black dot, black scurf, dry rot- *F. coeruleum and F. sulphureum* and PCN Ro1, Pa 2/3 and 1.

Vales Everest

Resistant to: black scurf, external damage and PCN Pa 2/3 and 1.
Susceptible to: dry rot- *F. sulphureum* and black dot.

Vales Sovereign

Resistant to: black dot, blackleg, common scab and PCN Ro1
Susceptible to: skin spot, tuber late blight, powdery scab, PCN Pa2/3, and 1.

The 2005 test results were published in Excel and PDF format on BPC website under R & D. The location was, however, not easily found on the site and it was thought that many growers might not be aware of its existence. In order to facilitate the publication of NL and IVT results more rapidly in a more accessible format and to draw the various publications on potato varieties produced under the auspices of BPC together e.g. Scotland The Natural Home of Potatoes, Pocket Guide to Varieties of Potato, SASA proposed to BPC that the PHP and MySQL platform used for European Cultivated Potato Database be modified to provide a database meeting all these needs. A project to develop this database was agreed with Export and Seed Unit of BPC and it is intended that British Potato Variety Database will be launched at Potatoes in Practice event in August, 2007.

2.5 References

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