



Independent Variety Trials 2002-2004

Final report

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Summary

Project aims:

The project was designed to carry out independent tests and trials to assess the performance of new potato varieties in respect to resistance and certain aspects of field performance.

Work undertaken and key findings:

Potato varieties were selected from breeders for inclusion in Independent Variety Trials (IVT) in controlled disease resistance tests and field trials. The experimental techniques for pest and disease resistance and defect ratings used existing established techniques and new ones developed with BPC funding from the previous IVT programme. The tests, which were predominantly under semi-controlled conditions, were designed to produce reliable ratings to reflect the performance of potato varieties under commercial growing conditions.

Agronomic, yield and tuber characteristics were established using a series of core trial sites run by the partners supplemented by a series of observation plots operated by commercial companies. The core trials had varying levels of recording in order to assess the characters required to be measured.

Twenty-two varieties completed IVT trials and tests during this programme, together with appropriate control varieties:

Table 1: Varieties completing IVT programme 2002-2004

Year completed	Variety	Agent	Year completed	Variety	Agent
2002	Lady Felicia	MBM	2003	Lynx	Cygnets
2002	Cabaret	Cygnets	2004	Bernadette	Taylor
2002	Isle of Jura	Cygnets	2004	Rembrandt	MBM
2002	Konsul	Agrico	2004	Sunset	Watts
2002	Agata	Agrico	2004	Celia	Watts
2002	Asterix	MBM	2004	Nadia	Watts
2002	Lady Balfour	Greenvale	2004	Paramount	Mara
2003	Lady Christl	MBM	2004	Aldo	Dobbin
2003	Melody	MBM	2004	Hunter	Brady
2003	Virgo	Agrico	2004	Tay	SCRI
2003	Eve Balfour	Greenvale	2004	Robinta	Skea

Resistance to foliage blight ranged from 1 to 8 with Lady Balfour being the most resistant. The range was even larger with tuber blight with Nadia showing a high level of resistance coming out at 9 on the scale. Rembrandt is interesting in being rated at 3 for foliage but 8 for tuber blight. Other varieties combined good resistance to both foliar and tuber blight.

Relatively high resistance to common scab was recorded in Lady Christl and Melody whilst Lady Balfour and Tay were highly susceptible. There was a similar range in the results for powdery scab with Lady Balfour, Rembrandt, Nadia, Paramount and Robinta showing high resistance and Virgo, Lynx and Celia being susceptible.

With the skin blemish diseases (black dot, skin spot, silver scurf and black scurf) variety differences were apparent with all four diseases. There was most discrimination for skin spot and black dot, but less for silver scurf and black scurf. Nevertheless there appears to be enough resistance to be part of an integrated control approach. Cabaret and Konsul appear to have the best overall resistance to these diseases.

With the storage disease, gangrene and two types of dry rot, Tay and Bernadette have good overall resistance with Virgo being particularly susceptible. Of the two dry rots tested (*Fusarium coeruleum*(*F.c*), & *F. sulphureum*(*F.s*)) there is a poor correlation (0.27) between the resistance to *F.c* and *F.s* indicating the importance of knowing which species is present and the relative susceptibility of varieties. The overall level of resistance to *F.c* is higher than to *F.s* where Robinta, Hunter, Eve Balfour, Nadia and Virgo all record ratings of 1.

High yield potential was demonstrated by Virgo although dry matter levels were low at 17% which could limit market appeal. Hunter and Nadia recorded low tuber number with Nadia also showing relatively high yield potential. Agata, Hunter and Konsul gave early haulm maturity with Sunset and Lady Balfour being particularly late.

Conclusions:

Of the varieties tested there was a range of disease resistance characters identified as well as differences in agronomic performance. No one variety contained a combination of characters that would immediately identify it as being superior to the current market leaders. There was a high level of resistance to each disease tested in at least one variety which demonstrates that the genetic potential is there to increase the variety contribution in integrated disease control strategies. The continuing challenge to potato breeders is to combine broad-spectrum disease resistance into a single variety that also has acceptable agronomic and end user quality characteristics.

Experimental Section

Introduction

Potato varieties were selected from breeders for inclusion in Independent Variety Trials (IVT) in controlled disease resistance tests and field trials. The experimental techniques for pest and disease resistance and defect ratings used existing established techniques and new ones developed with BPC funding from the previous IVT programme. The tests, which were predominantly under semi-controlled conditions, were designed to produce reliable ratings to reflect performance of potato varieties under commercial growing conditions.

Agronomic, yield and tuber characteristics were established using a series of core trial sites run by the partners supplemented by a series of observation plots operated by commercial companies. The core trials had varying levels of recording in order to assess the characters required to be measured.

Methodology for disease tests

Foliage Blight

Method

A field trial with small plots which were exposed to blight as a result of artificially inoculated spreader rows and accurately controlled mist irrigation.

Design and layout

Design: Fully randomised blocks with 4 replicates

Layout: Plots consist of 4 plants in a row. These were planted at right angles to and either side of a spreader row consisting of a susceptible variety.

First early varieties (FE) were planted in a separate trial. Seed were held at 5 – 10 °C and planted 3 to 4 weeks later than second early and maincrop varieties (SE/MC)

Inoculum

The spreader rows were inoculated by spraying plants with a zoospore suspension towards the end of the day and covering these with a polythene bag until the following morning. The isolate of *Phytophthora infestans* must possess virulence for as many R-gene as practicable and was tested on differentials for R1-R11 prior to inoculation. The isolate selection was kept under review in the light of new knowledge concerning genetic diversity in *P. infestans* populations.

Control varieties

NL controls: Stirling, Bintje

Additional marker varieties: Première (FE), Russet Burbank (SE/MC), Santé (SE/MC), Cara (SE/MC)

Observations

The percentage foliage affected by blight was assessed visually on at least 6 occasions during the epidemic. Blight susceptibility was expressed as the area under the disease progress curve. Varieties were tested for a minimum of 3 seasons. Exceptionally NL data is not used for this character.

Explanatory note

The NL test for foliage blight uses pot plants raised in the green house and sprayed with a zoospore suspension. After incubation the percentage of necrotic tissue is assessed. The method used for IVT uses field grown plants in which disease is allowed to build up on the

test plots from inoculum arriving from spreader rows. This method takes all stages of the disease cycle, infection rate, duration of latency rate, of lesion growth and sporulation into account, whereas the pot plant method does not. The area under the disease progress curve was shown to be closely correlated with the apparent infection rate.

Reference

Dowley LJ, Carnegie SF, Balandras-Chatot C, Ellisèche D, Gans P, Schöber-Butin & Wustman R (1999). Guidelines for evaluating disease resistance in potato cultivars. Foliage blight resistance (field test) *Phytophthora infestans* (Mont.) de Bary. *Potato Research* **42**: 107

Tuber blight

Method

Freshly harvested, field grown tubers were inoculated by spraying a suspension of zoospores on the unset skin. The inoculated tubers were held at high humidity (close to 100%) to ensure infection. The procedure is identical to the National List test.

Design and layout

Design: Tubers were grown in non-replicated plots. Following harvest the tuber lots were set up in fully randomised blocks with 4 replicates.

Layout: Tubers, minimum 40 tubers per replicate, were placed in plastic trays with the rose end up. Blocks consisted of a stack of trays. Replicate tuber lots may have been harvested on more than one date e.g. reps 1 +2 on date 1 and reps 3 +4 on date 2.

Inoculum

The same isolate was used for tuber and foliage blight tests.

Control varieties

NL controls: Stirling, Bintje

Additional marker varieties: Première (FE), Russet Burbank (SE/MC), Santé (SE/MC), Cara (SE/MC)

Observations

Blight susceptibility was expressed as the percentage of tubers which were infected. Wound and stolon end infections were not included. Varieties in NL trials were tested for 2 seasons at two centres. Other varieties were tested for a minimum of 3 seasons.

Reference

Stewart HE, McCalmont DC & Wastie RL (1983). The effect of harvest date and the interval between harvest and inoculation on the assessment of the resistance of potato tubers to late blight. *Potato Research* **26**: 101-107

Black dot

Method

A pot plant trial in which microsclerotia of *Colletotrichum coccodes* were mixed with potting compost.

Design and layout

Design: Pot plants were grown in randomised blocks with 6 replicates.

Layout: Each block of pots were laid out in a square. After harvest the tubers were held at high humidity until the symptoms were sufficiently clear for assessment.

Inoculum

Microsclerotia were produced from cultures on a vermiculite and maize-meal medium.

Control Varieties

Control varieties: Fianna, Romano, Santé, King Edward, Saxon, Pentland Squire.

Observations

Susceptibility was expressed as the average percentage of the tuber surface showing symptoms. Varieties were tested for a minimum of 3 seasons.

Explanatory note

This method was used on an experimental basis at NIAB during 1999 – 2001.

Silver Scurf

Method

A pot plant trial in which seed tubers were dipped in a suspension of conidia and macerated mycelium of *Helminthosporium solani* prior to planting.

Design and layout

Design: Pot plants were grown in randomised blocks with 6 replicates.

Layout: Each block of pots were laid out in a square. After harvest the tubers were held at high humidity until the symptoms were sufficiently clear for assessment.

Inoculum

Conidia of *Helminthosporium solani*. were produced by seeding agar growth medium plates with a suspension of conidia and mycelium produced from an initial colony on agar.

Control Varieties

Control varieties: Fianna, Romano, Santé, King Edward, Saxon, Pentland Squire.

Observations

Susceptibility was expressed as the average percentage of the tuber surface showing symptoms. Varieties were tested for a minimum of 3 seasons.

Explanatory note

This method was used on an experimental basis at NIAB during 1999 – 2001. The method has also been compared with dipping progeny tubers in inoculum.

Rhizoctonia

Method

A pot plant trial in which sclerotia of *Rhizoctonia solani* were mixed with potting compost.

Design and layout

Design: Pot plants were grown in randomised blocks with 6 replicates.

Layout: Each block of pots were laid out in a square.

Inoculum

Microsclerotia were produced from cultures on a vermiculite and maize-meal medium.

Control Varieties

Control varieties: Fianna, Romano, Santé, King Edward, Saxon, Pentland Squire.

Observations

Susceptibility was expressed as the average percentage of the tuber surface showing symptoms. Varieties were tested for a minimum of 3 seasons.

Explanatory note

This method was used on an experimental basis at NIAB during 1999 – 2001.

Skin Spot

Method

A pot plant trial in which conidia of *Polyscytalum pustulans* were mixed with potting compost.

Design and layout

Design: Pot plants were grown in randomised blocks with 6 replicates.

Layout: Each plot consisted of a pot plant.

Inoculum

Conidia of *Polyscytalum pustulans* were produced by seeding agar growth medium plates with a suspension of conidia produced from an initial colony on agar. After harvest the tubers were held at a low temperature (5 – 10 °C) until the symptoms were sufficiently clear for assessment.

Control Varieties

Control varieties: Fianna, Romano, Santé, King Edward, Saxon, Pentland Squire.

Observations

Susceptibility was expressed as the average percentage of the tuber surface showing symptoms. Varieties were tested for a minimum of 3 seasons.

Explanatory note

This method was used on an experimental basis at NIAB during 1999 – 2001. The method has also been compared with dipping progeny tubers in inoculum.

Blackleg

Method

Seed tubers were inoculated with a darning needle immediately prior to planting in the field. Disease expression was enhanced by intensive irrigation. The procedure is identical to the National List test.

Design and Layout

Design: Fully randomised blocks with 4 replications

Layout: Plots consisted of 10 inoculated and 10 uninoculated plants 2 rows side by side.

Inoculum

Inoculum was prepared as an aqueous suspension. The eye of a darning needle was dipped in the suspension and stabbed into the seed tuber at the stolon end.

Control varieties

NL controls: Ailsa, Concurrent

Additional marker varieties: Estima, Marfona, Hermes

Observations

The number of seed tubers failing to emerge and plants showing symptoms were counted. Susceptibility was expressed as the percentage of plants affected, including failure to emerge. Varieties in NL trials were tested for 2 seasons at two centres. Other varieties were tested for a minimum of 3 seasons.

Reference

Lapwood D.H. & Gans P.T. (1984). A method for assessing the field susceptibility of potato cultivars to blackleg (*Erwinia carotovora* susp. *atroseptica*). *Annals of Applied Biology* **104**: 315-320.

Lapwood D.H., Read P.J. & Gans P.T. (1985). The field susceptibility of potato varieties to Blackleg caused by *Erwinia carotovora* subsp. *atroseptica*. *Journal of the National Institute of Agricultural Botany* **17**: 107-116

Gans P.T., Jellis G.J., Little G., Logan C. & Wastie R.L. (1991). A comparison of methods to evaluate the susceptibility of potato cultivars to blackleg (caused by *Erwinia carotovora* subsp. *atroseptica*) in the field at different sites. *Plant Pathology* **40**: 238-248.

Common Scab

Method

A field trial with small plots grown in free draining sandy soil, where common scab is known to be a problem. The procedure is identical to the National List test.

Design and layout

Design: Incomplete blocks with 4 replicates.

Layout: Plots consisted of a row of 3 plants.

Inoculum

Streptomyces scabies is ubiquitous and no artificial inoculum is required. The plots may be covered with polythene in the early stages to ensure symptom expression.

Control varieties

NL controls: Maris Piper, Pentland Crown

Additional varieties: Désirée, Maris Peer, Estima

Observations

Susceptibility was expressed as the average percentage of the tuber surface showing symptoms. Varieties in NL trials were tested for 2 seasons at two centres. Other varieties were tested for a minimum of 3 seasons.

Potato cyst nematode

Method

A pot plant trial with a known number of cysts in the soil. The number of cysts at the end of the growing season was counted. The procedure is identical to the National List test.

Design

Design: Randomised blocks in 5 replicates.

Inoculum

A population of *Globodera rostochiensis* (Ro₁) and of *G. pallida* (Pa₂₋₃) was maintained from year to year on pot plants and cysts were collected, checked for purity, counted and the number of eggs and juveniles per cyst estimated. Cysts were added to the potting compost at a concentration of 10-15 eggs per g of soil.

Control varieties

NL controls: Désirée, Estima (*G. rostochiensis*) and Santé (*G. pallida*).

Additional varieties: Santé, Nadine, 12380 (very high partial resistance).

Observations

Susceptibility was expressed as the rate of reproduction relative to the susceptible control varieties. Varieties for which the breeder claimed qualitative (single gene) resistance to *G. rostochiensis* were tested only once with 3 replicates for confirmation. Varieties in NL trials were tested for 2 seasons at two centres. Other varieties were tested for a minimum of 3 seasons.

Spraing (TRV)

Method

A pot plant trial using soil infested with viruliferous free-living nematodes collected from the field.

Design and layout

Design: Fully randomised blocks with 8 replications.

Layout: Plots consisted of a single plant in a pot.

Inoculum

10 cm pots were filled with soil collected from an infested site. Each pot was planted with four bait seedlings of *Nicotiana tabacum* L. var. White Burley. Soil from pots with one or more plants showing TRV symptoms was transferred to 12.5 square pots and filled with additional soil from the same field.

Control varieties

Controls: Pentland Dell

Additional marker varieties: Maris Bard, Estima, Maris Piper

Observations

Progeny tubers were stored at 10 – 20 °C for at least 2½ months. The tubers were diced and the incidence of spraing symptoms were assessed visually. Varieties were tested for a minimum of 3 seasons.

Explanatory note

Resistance to spraing was assessed previously in field exposure trials. A pot test was used in order to overcome problems caused by the uneven distribution of the pathogen in soil.

References

Dale MFB & Solomon RM (1988). A glasshouse test to assess the sensitivity of potato cultivars to tobacco rattle virus. *Annals of applied Biology* **112**: 225- 229.

Richardson DE (1970). The assessment of varietal reactions to spraing caused by tobacco rattle virus. *Journal of the National Institute of Agricultural Botany* **12**: 112-118.

Powdery Scab

Method

A pot plant trial in which cystosori of *Spongospora subterrane* were mixed with potting compost.

Design and layout

Design: Pot plants were grown in randomised blocks with 6 replicates.

Layout: Each plot consisted of a single pot plant.

Inoculum

Cystosori were collected by collecting peelings from commercial potatoes with Powdery Scab.

Control varieties

NL controls: Estima, Santé

Additional varieties: Maris Piper, Romano, Désirée

Observations

Both pustule and canker symptoms were recorded. Susceptibility was expressed as the average percentage of the tuber surface showing pustule symptoms. Varieties were tested for a minimum of 3 seasons.

Dry rot

Method

Field grown tubers were wounded and the fresh wounds were contaminated with inoculum of *Fusarium coeruleum* and *F. sambucinum* (= *F. sulphureum*)

Design

Design: Tubers were grown in non-replicated plots. Following harvest the tuber lots were set up in 2 separate tests for each pathogen and in fully randomised blocks with 4 replicates.

Inoculum

The two pathogens were grown on a medium of sand, vermiculite and maize-meal. The tuber lots, minimum 40 per replicate, were damaged by rolling in a cement mixer together with the inoculum.

Control varieties

Maris Piper, Wilja, Romano. Marfona, Pentland Squire

Observations

Susceptibility was expressed as the average percentage of the tubers affected.

Explanatory note

Tests for susceptibility of varieties to these two types of dry rot were carried out at NIAB during the periods 1991 - 1995 and 1999 – 2001 on an experimental basis.

Reference

Gray EG & Paterson MI (1971). The effect of the temperature of potato tubers on the incidence of mechanical damage during grading and of gangrene (caused by *Phoma exigua*) during storage. *Potato Research* **14**: 251-262.

Gangrene

Method

Field grown tubers were wounded and the fresh wounds were contaminated with inoculum of *Phoma foveata*.

Design

Tubers were grown in non-replicated plots. Following harvest tubers were set up in randomised blocks with 20 replicates. Each replicate consisted of a single tuber. All varieties in a single replicate were grouped together in a tray.

Inoculum

The pathogens were grown on a medium of sand, vermiculite and maize-meal. The tubers were damaged by rolling in a cement mixer, together with the inoculum, one replicate at a time.

Control varieties

NL control varieties: Ulster Sceptre, Arran Consul

Additional varieties: Santé, Maris Piper, Lady Rosetta

Observations

Susceptibility was expressed as the average percentage of the tuber affected. Varieties were tested for a minimum of 3 seasons.

Reference

Carnegie SF, Gans PT, Jellis GJ, Little G, Logan C, & Wastie RL (1989). The susceptibility of potato cultivars to gangrene in laboratory tests in relation to origin of tubers, damage, method of inoculation and test centre. *Potato Research* **32**: 301-309.

Gray EG & Paterson MI (1971). The effect of the temperature of potato tubers on the incidence of mechanical damage during grading and of gangrene (caused by *Phoma exigua*) during storage. *Potato Research* **14**: 251-262

PVY & PLRV

Method

Field grown plots were exposed to viruliferous aphids as a result of rows of virus infected plants and the activity of natural aphid populations.

Design and layout

Design: Randomised block with 4 replicates.

Layout: Plots consisted of 2 rows of 5 plants. Each plot was flanked on one side by a row of PVY infected plants. Across the rows, between each line of plots there was a row of PLRV infected plants.

Inoculum

PVY and PLRV infected plants were raised in the greenhouse during the previous season to provide tubers to plant.

Control Varieties

NL Control varieties: Maris Piper, Colleen, Pentland Crown

Additional varieties: Estima, Santé

Observations

A single progeny tuber was harvested from each plant and tested for PVY and PLRV by the ELISA method. Susceptibility was expressed as the percentage of tubers testing positive for either virus. All varieties were tested for 2 seasons at 2 sites.

Bruising and damage

Method

A standard impact was delivered to tubers by dropping a bolt through a fixed length of PVC tube onto a tuber.

Design and layout

Tubers were grown in non-replicated plots at 2 sites. A minimum of 50 tubers were treated for each variety. There was no replication within a site.

Test conditions

Following harvest, tubers were stored for 2-3 weeks at ambient and then at a constant temperature between 6°C and 10°C. First and second early varieties were treated between October and December and maincrop varieties between January and March.

Control varieties

NL control varieties: Ulster Sceptre Pentland Crown

Additional varieties: Russet Burbank, Desiree, Cara

Observations

External damage was assessed as frequency of the occurrence of splitting. Internal damage was assessed by cutting all the tubers and measuring the depth of damage perpendicular to the tuber surface. All varieties were tested for 2 seasons at 2 sites.

Reference

Schipper PA (1971). Measurement of black spot susceptibility of potatoes. *American Potato Journal* **48**: 71-81.

Internal Rust Spot**Method**

A pot plant trial in which symptoms were artificially reproduced as a result of calcium shortage.

Design

Design: Pot plants were grown in randomised blocks with 4 replicates.

Layout: Each block of pots were laid out in a square. Each plot consisted of a single pot plant.

Control varieties

Cultra, Fianna, Hermes, Maris Piper, Wilja

Observations

Tubers were cut and assessed for the severity of internal rust spot. An average severity index was calculated for the tubers from each pot. Varieties were tested for a minimum of 3 seasons.

Explanatory note

This method was used on an experimental basis at NIAB during 1999 – 2001.

Methodology for field trials

Trial Programme

Summary: The core programme consisted of sites, covering a range of geographic, environmental and growing conditions. The sites were Scotland (managed by SAC), the west Midlands (managed by NIAB team in the West Midlands), a good skin finish site in East Anglia (a silt soil) and a irrigated sand site in East Anglia (the latter two sites were managed by NIAB East Anglian based staff). An additional mature lift site was conducted by Scott Abbot Arable Crops Centre and NIAB at SAACS's expense.

Early bulking potential/punnett production: At two of the sites additional plots were grown for estimation of early bulking potential and potential for punnett production. The two sites were the West Midlands site and the silt land site in East Anglia.

Samples for storage: At two of the sites additional single plots of each variety in the IVT trial system were grown to provide samples for the storage component of the IVT programme to be conducted by SBEU. The plots were of sufficient size to produce 75 kg of produce. The two sites were Scotland and the irrigated site in East Anglia.

First Early Trial: A single trial for first early varieties were grown in an area of First Early production.

Preliminary screening plots: A single set of preliminary screening plots were grown adjacent to the NL observation plots at NIAB Cambridge and assessed on the same basis to provide basic data for the Common Catalogue. These were varieties which had not been tested within the UK National List system and these plots did not utilise common origin seed.

Introduction and general instructions

Summary: The aim of the potato variety trials was to grow a range of test varieties against control varieties to compare variety characteristics. The seed used was as physiologically uniform as possible while conditions aimed to be typical of commercial practice with minimum environmental variability. Replicated trials and single observation plots were grown at a range of sites with support from industry. Records varied according to the type of trial. Full records were taken from replicated trials at up to 4 sites per year with a reduced sub-set from industry run observation plots.

Management of trial: The trials officers were responsible for choice of site and for the establishment, supervision, recording and harvesting of the trial.

Site selection: The trials were sited within commercial crops of potatoes in a soil appropriate for the crop type, away from the headland. It was important to choose sites with a known history which were uniform and with no history of soil-borne problems. There was preferably at least a 5-year break from a previous potato crop, and the sites were free of groundkeepers. The trials were laid out so that tramlines or irrigation runs did not pass through plots. This may have necessitated the need for 4 row discards up the length of the trial area.



Analysis prior to establishing trial: Representative soil samples from the trial sites were assessed for pH, N, P, K & Mg status, for major micronutrients and for PCN populations prior to planting the trial and any fertiliser applications. The Potato Crop specialist was consulted if the trial was to be sited on a PCN infected farm.

Husbandry: The husbandry of the trials was according to the best local practice, normally as per the host growers surrounding commercial crop.

Crop protection: A full blight/aphid spray programme was used as routine. Measures were taken to avoid damage from slugs or other soil borne pests.

Irrigation: Irrigation followed local practice. Every effort was made to ensure an even application.

Herbicide: Herbicide applications were made at the optimum timing for the trial. If planting date differed from the host crop then separate applications were made. Care was taken with the herbicide programme to avoid products which were known to affect some varieties (e.g. products containing Metribuzin)

Haulm destruction: For the maincrop trial desiccation was not carried out before 90% of varieties were senescing. The manner of haulm destruction was decided locally after consultation with the Potato Team at NIAB.

Abandoning trials: Any decision to abandon trials was taken in consultation with Potato Team, NIAB.

Data capture: Data was recorded either on paper for later entry onto computer or electronically using the FIDO or Excel compatible software. Where special observations were made (e.g. herbicide damage) these were recorded manually.

The data measures in the instructions were used with the given scales and variations of these were not used. Character names were written clearly at the top of the appropriate record sheets. Records were processed by computer.

All plot records were returned to Potato Team NIAB as soon as records for each character were complete.

Control Varieties:

Maincrop:	Estima, Maris Piper, Lady Rosetta and Desiree
Early Bulking:	Estima, Charlotte
First Early:	Maris Bard
Set Skin Small:	Charlotte, Nicola

Seed

Summary: Seed for trials was provided from common origin, chitted tubers. The seed was as healthy as possible and kept in storage and chitting conditions that attempted to produce a uniform physiological age across varieties. Seed treatment for *Rhizoctonia* was used if an infection threshold was exceeded in any variety.

Common origin: Common origin seed was produced by the NIAB at their Cockle Park centre. All stocks were tested for virus during the growing season.

Seed and sprout management: Normally seed was held at a central location under cold storage (3°C) conditions until immediately prior to planting at all sites.

Seed was supplied bagged by variety. Immediately on receipt, the seed was carefully placed into clean trays, rose end up and the condition of each variety noted and records made of any tubers discarded. Seed was supplied for trial purposes only.

Chitting conditions:

1. Even illumination was given to all varieties during chitting.
2. All varieties received the same chitting treatment. If homogenous seed management was not achieved records were made of the variation in chitting management of the varieties affected.
3. Trays were turned regularly to ensure even temperature and light accumulation between trays. Preferably trays were stacked randomised as field replicates.
4. Seed was checked regularly, minimum every week, for condition of tubers and for any problems e.g. aphids, rats etc.
5. Chitting regimes were applied appropriate to the crop type. Thus chitting for early bulking involved more day degrees than for maincrop.

Records: Records were kept of the number of tubers discarded during the chitting period as unfit to plant.

All recordings by variety were made in the same order as the varieties were listed on the field plan. Records were made on the approved record sheet or electronic form.

Seed tuber treatment: If seed of any variety had 2% or more tubers with black scurf, all varieties were treated prior to planting with Monceren Dust according to the manufacturer's instructions.

Assessments on seed prior to planting:

Sprout Development: Seed tubers were assessed for the degree of sprouting prior to planting on a 1-4 scale where 1=no sprouting, 2=1-3mm chits, 3=small green chits, 4= large green chits.

Tuber health: Tubers were assessed for disease incidence and severity prior to planting (and any tuber treatment).

Trial layout / Site data

Main trials: Plots comprised 2 rows with a minimum of 10 tubers per row. Trial design was a randomised incomplete block design with two replicates. Seed spacing/row width were adjusted to give a population of 45,000 (+/- 5%). All varieties in the Scottish and East Anglian silt land trials were assessed for determinacy.

Earlies Bulking/Punnett trials: Plots comprised 2 rows with a minimum of 10 tubers per row. Seed spacing/row width were adjusted to give a population of 65,000 (+/- 5%). Only varieties for which early bulking or punnett market potential was claimed were planted in these trials.

First Early: Plots comprised a single row with a minimum of 10 tubers per row. Spacing followed local practice.

All trials

Harvest area: Harvest area for all trials to be a full plot length.

Gaps between plots: Sufficient gaps, end on end, between the plots were left to enable a machine lifter to clear.

Replicates and sub-blocks were kept as single blocks.

Planting method: Hand or machine planting methods were used, but seed was placed at uniform depth and spacing. Adequate cover was achieved to prevent production of excessive numbers of green tubers. The method of planting was recorded in the trial records.

Seed and site data: Seed and site data were recorded as listed on diary record sheets 1 and 2 and returned to the NIAB Potato Section immediately after planting.

Site and husbandry details: Record of site and husbandry details were recorded on diary record sheets 3-5 and returned to the NIAB Potato Section with yield data.

Trial Plan: A copy of the field plan was returned to the NIAB Potato Section immediately after planting. This included any changes made and the planting date.

Plot records

Missing plant, reaction to stress, virus and disease records:

These were taken when necessary to aid the validation of the trial. Records were taken when on site.

Number of missing plants - all plots on all trials:

Recorded number of missing plants in the plot. This was preferably assessed early in the season prior to plants meeting within the row.



Reaction to 'stress' (1-9) – all plots on all trials if present:

Recorded if necessary - e.g. frost damage, wind damage, drought stress etc 9 = no damage

Viruses and disease: Recorded routinely in early July and if appropriate on other occasions.

Plots were assessed for:

Blight as % canopy area affected.

Virus as the number of plants infected.

Blackleg as number of plants infected.

Rhizoctonia stem canker as number of plants infected.

Haulm development, canopy structure and foliage maturity (Scotland and East Anglian silt land + SAACS.)

Emergence date: Defined as the date 50 % of plants had emerged

Ground cover: Assessed as % ground cover. This was assessed sequentially throughout the season. (The suggested method was assessment at 14 day intervals from emergence until all varieties achieved 50% ground cover, then monthly intervals until haulm destruction).

Canopy structure – branching: The level of plant branching was recorded as a measure of determinacy in the variety where 9 = the most vigorous multibranching plant. Assessed at the same time as the final ground cover score before haulm burn off.

Foliage maturity: Maturity was assessed on a percentage scale with 100% equal to full natural senescence. Assessed the same time as ground cover.

Tuber Records

Maincrop harvest - after desiccation.

Recorded by variety:

Uniformity of size (1-9)	9 = good
Tuber shape (1-9)	9 = very long
Uniformity of shape (1-9)	9 = good
Eye depth (1-9)	9 = shallow
Skin texture (1-9)	9 = smooth
Flesh colour (1-9)	1 = white, 5 = light yellow, 9 = dark yellow
Skin colour	White, cream, yellow, red, parti-coloured (note both colours), other (note).
Skin set	% scuffing after treatment in the SAC barrel. (Only performed on the produce from the Scottish Site.)

All plots:

Graded yield into <45 mm, 45 - 65 mm, 65 - 85 mm and >85 mm. Removed outgrades > 45 mm during grading.

Weighed tuber yield <45 mm, 45 - 65 mm, 65 - 85 mm and >85 mm.

Counted tuber number <45 mm, 45 - 65 mm, 65 - 85 mm and >85 mm and total outgrades.



Outgrades: sorted into the categories below and weighed and recorded.

Growth cracks
Greens
Misshapen
Slug damage
Wireworm
Tuber blight
Wet rots
Others

Internal defects: recorded on 20 cut tubers from the 65 - 85 fraction. If there were insufficient tubers of the preferred grade the largest available tubers were assessed - recorded by number affected.

Hollow heart	presence or absence
Internal rust spot	presence or absence
Vascular browning	presence or absence
Other defects	presence or absence

Dormancy break: from the ware produce of each variety at 3 sites a sample of 20 representative tubers was stored. The 3 sites were the Scottish site (held at SAC), the East Anglian silt land site and the SAACS site (both held at Cambridge.) Detailed emergence and canopy records were taken from these trials. The tubers were held under uniform (stated) storage conditions and monitored for sprouting on a weekly basis. The dates when 50% tubers had at least one sprout 3mm long were recorded.

Early bulking trial:

Graded yield into <45mm, >45mm
Weighed tuber yield <45mm, >45mm
Counted tuber number <45mm, >45mm

Set Skin smalls early lift:

Graded yield into <25mm, 45- 45mm, >45mm.
Weighed tuber yield <25mm,45- 45mm, >45mm.
Counted tuber number <25mm, 45 - 45mm, >45mm

Earlies trial: All plots were harvested from June onwards when the majority of first earlies had tuber sizes between 35mm and 65mm.

Recorded by variety:

Uniformity of size (1-9)	9 = good
Tuber shape (1-9)	9 = very long
Uniformity of shape (1-9)	9 = good
Eye depth (1-9)	9 = shallow
Skin texture (1-9)	9 = smooth
Flesh colour (1-9)	1 = white, 5 = light yellow, 9 = dark yellow
Skin colour	White, cream, yellow, red, parti-coloured (note both colours), other (note colour)
Dry matter	as % or Specific gravity

All plots:

Graded yield into < 35mm, >35mm. Removed outgrades >35 mm during grading.

Weighed tuber yield < 35mm, >35mm.

Counted tuber number < 35mm, >35mm and total outgrades.

Outgrades: sorted into the categories below and weighed and recorded.

Growth cracks

Greens

Misshapen

Mechanical damage

Slug damage

Tuber blight

Wet rots

Internal defects: recorded on 20 cut tubers from the >35mm fraction - recorded by number affected and severity for selected characters

Hollow heart presence or absence

Internal rust spot presence or absence

Vascular browning presence or absence

Other defects presence or absence

Storage Samples

Storage samples were sent to BPC experimental storage facilities at Sutton Bridge within one week of harvest. Material for this study was grown in single non replicated plots at the same site, in plots a minimum 2 rows wide x 10 m long, or greater to achieve over 75 kg of ware sized tubers. Seed rate was between 34,000 to 55,000 seed/ha.

All varieties were to be grown for storage. Maris Piper was produced on larger plots to produce 150 kg to be assessed in store as a packer and processor variety.

First earlies were not grown for storage.

Punnet varieties were planted at a high population of approximately 75,000 seeds/ha. Punnet plots may have required defoliation before the maincrops.

Storage samples were grown at two sites: 1) Scotland 2) East Anglian sand land site.

Storage samples were delivered to SBEU directly they were lifted.

In addition to the storage assessments SBEU used these samples for dry matter and fry colour assessments.

Results

Table 2: Summary of Disease Resistance Ratings*

	PCN RoI	PCN Pa2/3	Foliage blight	Tuber blight	Common scab	Powdery scab	Blackleg	Black dot	Skin spot	Silver scurf	Black scurf	Gangrene	Dry rot ¹	Powdery dry rot ²	PVY	PLRV	TRV
Lady Felicia	r	s	1	1	6	7	1	1	8	2	6	4	6	7	9	7	1
Cabaret	r	s	3	2	2	5	7	6	7	6	6	7	5	3	1	5	1
Isle Of Jura	r	s	3	3	5	4	7	2	6	5	6	6	3	3	9	5	8
Konsul	s	s	2	5	5	4	3	5	5	6	6	2	6	6	4	5	2
Agata	-	-	1	3	4	6	6	1	3	5	7	4	3	4	4	7	9
Asterix	r	s	3	6	5	2	9	4	6	4	6	6	7	4	3	5	9
Lady Balfour	(4)	(4)	8	3	1	8	7	2	5	4	6	3	5	3	8	5	1
Lady Christl	r	s	1	5	7	2	1	3	3	1	7	4	4	5	9	4	8
Melody	r	s	5	6	7	4	3	4	7	2	6	3	3	6	9	4	6
Virgo	s	s	2	4	4	1	3	6	4	3	6	1	3	1	1	4	4
Eve Balfour	(5)	(5)	7	8	3	5	9	4	5	3	5	5	6	1	7	5	7
Lynx	-	-	2	4	5	1	2	4	6	3	7	6	6	5	3	4	8
Bernadette	r	s	3	2	5	7	1	3	3	1	6	7	7	5	7	6	5
Rembrandt	r	(3)	3	8	6	8	3	5	2	1	5	7	6	4	8	3	6
Sunset	r	s	7	5	5	7	9	3	6	1	7	5	6	4	9	5	5
Celia	r	s	7	8	3	1	7	5	3	1	7	3	5	3	4	4	8
Nadia	s	s	6	9	4	8	5	4	8	1	6	6	4	1	3	5	3
Paramount	r	s	4	5	5	8	9	4	7	1	8	7	4	4	3	5	8
Aldo	r	s	5	6	6	7	7	3	1	1	6	6	7	4	9	8	1
Hunter	r	s	3	4	5	4	2	3	7	1	6	8	5	1	6	6	9
Tay	r	s	5	9	1	6	5	4	1	2	6	9	8	6	2	5	1
Robinta	r	(3)	6	7	6	8	4	4	2	1	6	8	6	1	2	6	8

¹ *Fusarium coeruleum*, ²*F. sulphureum*. () = limited data

* The disease rating scores are on a 1 to 9 scale where 1 = susceptible and 9 = high resistance. Note that 9 does not always equal no disease as 9 is most resistant and 1 is most susceptible on a scale set by the behaviour of the selected control varieties.

Table 3: Summary of Agronomic Characters (Maincrop/second early)

Variety	Dry matter %	Shape 1-9 (9=long)	Shape uniformity 1-9 (9=good)	Flesh colour 1-9 (9=yellow)	Eye depth 1-9 (9=shallow)	Skin texture 1-9 (9=smooth)	Emergence %	Foliage maturity %	Ground cover %	Ware tuber numbers /10 plants	Total sound yield (t/ha)
Desiree	20.3	6	5	4	4	6	78	28	88	68	63.1
Estima	19.4	6	6	4	6	6	84	56	90	68	59.3
Lady Rosetta	23.1	3	6	4	4	4	56	47	80	59	45.6
M Piper	21.0	5	6	3	6	5	91	23	97	83	64.6
Cabaret	20.6	7	5	2	6	6	70	28	77	58	50.9
Isle Of Jura	20.2	6	6	4	7	6	38	32	88	80	59.7
Konsul	18.1	5	5	5	6	6	95	72	94	71	65.8
Agata	18.8	6	6	5	6	6	96	85	94	65	52.5
Asterix	21.7	7	6	5	5	5	90	22	95	74	65.0
Lady Balfour	17.9	6	6	3	6	4	69	3	67	64	64.0
Melody	19.7	6	6	5	6	6	71	33	86	75	60.7
Virgo	16.9	7	6	2	6	6	83	49	90	66	76.0
Eve Balfour	18.3	4	6	3	5	5	93	30	76	67	53.1
Lynx	20.9	7	6	2	6	6	69	43	88	62	56.3
Rembrandt	20.7	6	6	4	6	6	95	71	90	71	61.3
Sunset	18.5	6	5	5	6	5	82	11	86	63	67.8
Celia	16.1	4	6	3	5	5	81	27	87	58	60.8
Nadia	18.5	5	5	2	4	5	86	23	90	55	68.9
Paramount	18.7	6	5	3	5	5	86	41	88	78	64.7
Aldo	21.3	5	6	4	5	5	85	54	83	73	65.9
Hunter	19.6	5	6	5	5	5	82	74	80	54	51.2
Tay	22.1	5	6	3	5	6	86	48	76	74	51.7
Robinta	20.3	5	5	3	5	5	87	33	88	68	66.2

Table 4: Summary of Agronomic Characters (Set Skin Small)

Variety	Dry matter %	Shape 1-9 (9=long)	Shape uniformity 1-9 (9=good)	Flesh colour 1-9 (9=yellow)	Eye depth 1-9 (9=shallow)	Skin texture 1-9 (9=smooth)	Ware tuber numbers /10 plants	Total sound yield (t/ha)
Charlotte	19.2	7	6	6	5	6	52	66.2
Nicola	19.0	6	6	6	4	6	53	74.1
M Peer	19.5	5	6	3	6	6	49	61.8
Bernadette	18.4	6	6	5	6	6	60	75.3

Table 5: Summary of Agronomic Characters (First Early)

Variety	Dry matter %	Shape 1-9 (9=long)	Shape uniformity 1-9 (9=good)	Flesh colour 1-0 (9=yellow)	Eye depth 1-9 (9=shallow)	Skin texture 1-9 (9=smooth)	Ware tuber numbers /10 plants	Total sound yield (t/ha)
Maris Bard	16.2	6	6	3	7	6	53	29.6
Premiere	17.4	5	6	5	5	6	54	23.1
Lady Felicia	15.6	5	7	6	6	6	60	29.6
Lady Christl	16.2	7	5	6	6	7	63	33.2

Discussion and Project Findings:

Resistance to foliage blight ranged from 1 to 8 with Lady Balfour being the most resistant. The range was even larger for tuber blight with Nadia showing a high level of resistance coming out at 9 on the scale. Rembrandt is interesting in being rated at 3 for foliage but 8 for tuber blight.

Relatively high resistance to common scab was recorded in Lady Christl and Melody whilst Lady Balfour and Tay were highly susceptible. There was a similar range in the results with powdery scab with Lady Balfour, Rembrandt, Nadia, Paramount and Robinta showing high resistance and Virgo, Lynx and Celia being susceptible.

With the skin blemish diseases (black dot, skin spot, silver scurf and black scurf) variety differences were apparent with all four diseases. There was most discrimination for skin spot and black dot, but less for silver scurf and black scurf. Nevertheless there appears to be enough resistance to be part of an integrated control approach. Cabaret and Konsul appear to have the best overall resistance to these diseases.

With the storage disease, gangrene and two types of dry rot, Tay and Bernadette have good overall resistance with Virgo being particularly susceptible. Of the two dry rots tested (*Fusarium coeruleum*(*F.c*), & *F. sulphureum*(*F.s*)) there is a poor correlation (0.27) between the resistance to *F.c* and *F.s* indicating the importance of knowing which species is present and the relative susceptibility of varieties. The overall level of resistance to *F.c* is higher than to *F.s* where Robinta, Hunter, Eve Balfour, Nadia and Virgo all record ratings of 1.

The variety descriptions below are based on the three-year programme and are given for those varieties completing trials between 2002-2004. Resistance to diseases is described as high where the variety has values of 7 and above on the 1 to 9 rating where 9 = high resistance (see Table 2 above). With ratings of 3 and below the varieties are described as susceptible.

Maincrop/Second Early:

Agata, oval tubers, white skin, cream/yellow flesh, relatively fast emergence, very early haulm maturity, relatively low dry matter, below average yield potential. High resistance to black scurf, potato leaf roll virus and tobacco rattle virus. Susceptible to black dot, dry rot (*F.c*), foliage blight, skin spot and tuber blight.

Aldo, oval tubers, white skin, cream flesh, moderate emergence, early haulm maturity, moderate dry matter, high yield potential. High resistance to blackleg, dry rot (*Fusarium coeruleum* (*F.c*)), potato leaf roll virus, potato virus Y and powdery scab. Susceptible to black dot, silver scurf, skin spot and tobacco rattle virus.

Asterix, long oval tubers, red skin, cream/yellow flesh, relatively fast emergence, late haulm maturity, moderate dry matter, high yield potential. High resistance to blackleg, dry rot (*F.c*) and tobacco rattle virus. Susceptible to foliage blight, potato virus Y and powdery scab.

Cabaret, long oval tubers, white skin, white flesh, moderate emergence, moderate dry matter, low tuber number, below average yield potential. High resistance to blackleg, gangrene and skin spot. Susceptible to common scab, foliage blight, potato virus Y, powdery dry rot (*F. sulphureum* (F.s)), tobacco rattle virus and tuber blight.

Celia, oval tubers, white skin, white flesh, moderate emergence, relatively low dry matter, low tuber number, average yield potential. High resistance to black scurf, blackleg, tobacco rattle virus and tuber blight. Susceptible to common scab, gangrene, powdery dry rot (F.s), powdery scab, silver scurf and skin spot.

Eve Balfour, oval tubers, white skin, white flesh, relatively fast emergence, relatively low dry matter, below average yield potential. High resistance to blackleg, foliage blight, potato virus Y, tobacco rattle virus, and tuber blight. Susceptible to common scab, powdery dry rot (F.s) and silver scurf.

Hunter, oval tubers, white skin, cream/yellow flesh, moderate emergence, early haulm maturity, moderate dry matter, low tuber number, below average yield potential. High resistance to gangrene, skin spot and tobacco rattle virus. Susceptible to black dot, blackleg, foliage blight, powdery dry rot (F.s) and silver scurf.

Isle Of Jura, oval tubers, white skin, cream flesh, relatively shallow eyes, slow emergence, moderate dry matter, high tuber number, average yield potential. High resistance to blackleg, potato virus Y and tobacco rattle virus. Susceptible to black dot, dry rot (F.c), foliage blight, powdery dry rot (F.s) and tuber blight.

Konsul, oval tubers, light yellow skin, cream/yellow flesh, relatively fast emergence, early haulm maturity, relatively low dry matter, high yield potential. Susceptible to blackleg, foliage blight, gangrene and tobacco rattle virus.

Lady Balfour, oval tubers, white skin parti-coloured pink, white flesh, rough skin texture, moderate emergence, very late haulm maturity, relatively low dry matter, high yield potential. High resistance to blackleg, potato virus Y and powdery scab. Susceptible to black dot, common scab, gangrene, powdery dry rot (F.s), tobacco rattle virus and tuber blight (limited data for tuber blight)

Lynx, long oval tubers, white flesh, moderate emergence, moderate dry matter, average yield potential. High resistance to black scurf and tobacco rattle virus. Susceptible to blackleg, foliage blight, potato virus Y, powdery scab and silver scurf.

Melody, oval tubers, yellow skin, cream/yellow flesh, moderate emergence, moderate dry matter, average yield potential. High resistance to common scab, potato virus Y and skin spot. Susceptible to blackleg, dry rot (F.c), gangrene and silver scurf.

Nadia, oval tubers, red skin, white flesh, relatively deep eyes, moderate emergence, late haulm maturity, relatively low dry matter, low tuber number, high yield potential. High resistance to powdery scab, skin spot and tuber blight. Susceptible to potato virus Y, powdery dry rot (F.s), silver scurf and tobacco rattle virus.

Paramount, oval tubers, red skin, white flesh, moderate emergence, relatively low dry matter, high yield potential. High resistance to black scurf, blackleg, gangrene, powdery scab, skin spot and tobacco rattle virus. Susceptible to potato virus Y and silver scurf.

Rembrandt, oval tubers, white skin, cream flesh, moderate emergence, moderate dry matter, average yield potential. High resistance to gangrene, potato virus Y, powdery scab and tuber blight. Susceptible to blackleg, foliage blight, potato leaf roll virus, silver scurf and skin spot.

Robinta, oval tubers, red skin, white flesh, relatively fast emergence, moderate dry matter, high yield potential. High resistance to gangrene, powdery scab, tobacco rattle virus and tuber blight. Susceptible to potato virus Y, powdery dry rot (F.s), silver scurf and skin spot.

Sunset, oval tubers, red skin, cream/yellow flesh, moderate emergence, late haulm maturity, relatively low dry matter, high yield potential. High resistance to black scurf, blackleg, potato virus Y and powdery scab. Susceptible to black dot and silver scurf.

Tay, oval tubers, white parti-coloured pink skin, white flesh, moderate emergence, moderate dry matter, below average yield potential. High resistance to dry rot (F.c), gangrene and tuber blight. Susceptible to common scab, potato virus Y, silver scurf, skin spot and tobacco rattle virus.

Virgo, long oval tubers, cream skin, white flesh, moderate emergence, very low dry matter, high yield potential. Susceptible to blackleg, dry rot (F.c), foliage blight, gangrene, potato virus Y, powdery dry rot (F.s), powdery scab and silver scurf

First Early:

Lady Christl, oval to long oval tubers with yellow skin, light yellow flesh, moderate dry matter, relatively high yield potential. High resistance to black scurf, common scab, potato virus Y and tobacco rattle virus. Susceptible to black dot, blackleg, foliage blight, powdery scab, silver scurf and skin spot.

Lady Felicia, oval tubers, cream/yellow flesh with yellow skin, moderate emergence, relatively low dry matter, high tuber number, average yield potential. High resistance to potato leaf roll virus, potato virus Y, powdery dry rot (F.s), powdery scab and skin spot. Susceptible to black dot, blackleg, foliage blight, silver scurf, tobacco rattle virus and tuber blight.

Salad:

Bernadette, long oval tubers, white skin, yellow/cream flesh, relatively late haulm maturity, moderate/low dry matter, high tuber number, relatively high yield potential. High resistance to dry rot (F.c), gangrene, potato virus Y and powdery scab. Susceptible to black dot, blackleg, foliage blight, silver scurf, skin spot and tuber blight.

Conclusions of Project:

Of the varieties tested there was a range of disease resistance characters identified as well as differences in agronomic performance. No one variety contained a combination of characters that would immediately identify it as being superior to the current market leaders. There was a high level of resistance to each disease tested in at least one variety which demonstrates that the genetic potential is there to increase the variety contribution in integrated disease control strategies.

With the skin blemish diseases (black dot, skin spot, silver scurf and black scurf) variety differences were apparent with all four diseases. There was most discrimination for skin spot and black dot, but less for silver scurf and black scurf. Nevertheless there appears to be enough resistance to be part of an integrated control approach. This would require further research to validate and determine control strategies.

On the agronomic front all varieties showed acceptable performance in terms of yield and dry matter. None of the varieties tested had dry matters higher than the crisping control and two were relatively low. Varieties with long oval shape and relatively high dry matter were identified that may have suitability for French fry production. Two varieties had late foliage maturity, a factor which may require additional inputs to manage.

The continuing challenge to potato breeders is to combine broad-spectrum disease resistance into a single variety that also has acceptable agronomic and end user quality characteristics and for this to be identified in a variety testing programme and taken up by the market.

Milestones:

Project milestones were met and the objectives of conducting tests with the newly developed skin blemish disease as well as the established tests were achieved. Industry run observation plots provided valuable additional data from a range of sites with limited recording as requested in the protocols.

Technology Transfer:

Over the period of the contract the following technology transfer events took place:

2002: Press articles on: Variety testing, DNA makes spud ID foolproof, New IVT testing programme at NIAB, Searching for agronomists' holy grail, Erasing black dot, Staying ahead of Spraing. Demonstration to NIAB Potato Agronomists Group. Review of programme by NIAB Potato Advisory Group and Potato Breeders. Preparation of NIAB's Potato Variety Pocket Guide sent to 2,000 members of NIAB Association Scheme with 116 additional sales.

2003: BPC publications: Independent Variety Trials and Storage Assessments, Fight against Blight. Press article: Good showing for Cabaret - and a premium for good earlies. Demonstration to NIAB Potato Agronomists Group. Review of programme by NIAB Potato Advisory Group and Potato Breeders. Preparation of NIAB's Potato Variety Pocket Guide sent to 2,000 members of NIAB Association Scheme with 135 additional sales.



2004: Poster presentation: Agronomy and Storage assessment of the Independent Variety Trials. BPC Publications: Disease & agronomy report of the Independent Variety trials 2003 season. Demonstration to NIAB Potato Agronomists Group. Demonstration to the National Association of Seed Potato Merchants (NASPM). Review of programme by NIAB Potato Advisory Group and Potato Breeders. Preparation of NIAB's Potato Variety Pocket Guide sent to 2,000 members of NIAB Association Scheme with 110 additional sales.

2005: BPC Publications: Disease & agronomy report of the Independent Variety trials 2004 season. Preparation of NIAB's Potato Variety Pocket Guide sent to 2,000 members of NIAB Association Scheme with 65 additional sales to date.

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