

The Scottish raspberry breeding programme

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Grower Summary

SF 35a

The Scottish Raspberry Breeding Consortium

Annual report 2005

SF 35a

The Scottish Raspberry Breeding Programme

Headline

- The selection 9053B6 continued to out-perform all other breeding selections and industry standard controls, Glen Ample and Tulameen, on growers' trials in 2005.
- The processing genotype 9062E-1 was outstanding in both machine harvesting and fresh trials.
- New selection 00123A7 was outstanding in SCRI protected trials and was initiated into early micropropagation for 2006 on-farm trials.
- Raspberry selections 9046RA2, 9050RD3 and 9059D-2 performed poorly in seasons 2004 and 2005 and are recommended to be dropped from the advanced list.

Background and expected deliverables

In 2002, the UK raspberry industry formed a Consortium to fund the raspberry breeding programme for seven years. The objective of the programme is to produce improved raspberry cultivars selected for particular markets and cultural practices.

The expected deliverables from this work will include:

- New potential cultivars suitable for both fresh market production, including season extension through protected cropping and machine harvesting for processing.
- New hybrids with improved pest and disease resistance, especially to *Phytophthora* root rot.
- Expanded and characterised germplasm collections for exploitation within the breeding programme.
- Evaluation of promising selections under commercial conditions on growers' trials.
- Generation of high health selections for commercial propagation and release to industry.

Summary of the project and main conclusions

On-Farm Trials

- 9053B6 continued to be outstanding on growers' trials this year.
- High health root material of 9053B6 was bulked up at commercial propagators as long cane for 2006 plantings.
- 9062E-1 was superb in both machine and fresh trials.
- 9050RD3 performed poorly in trials in 2004 and 2005 and was rejected.

- 9046RA2 performed well as a machine harvesting type, but is inferior to both 9053B6 and 9062E-1 in terms of yield, quality and disease tolerance, and is recommended for rejection.
- New trials will be evaluated in 2006, both on-farm and SCRI.
- Three new selections will be available to plant on-farm trials in spring 2006.

SCRI Trials

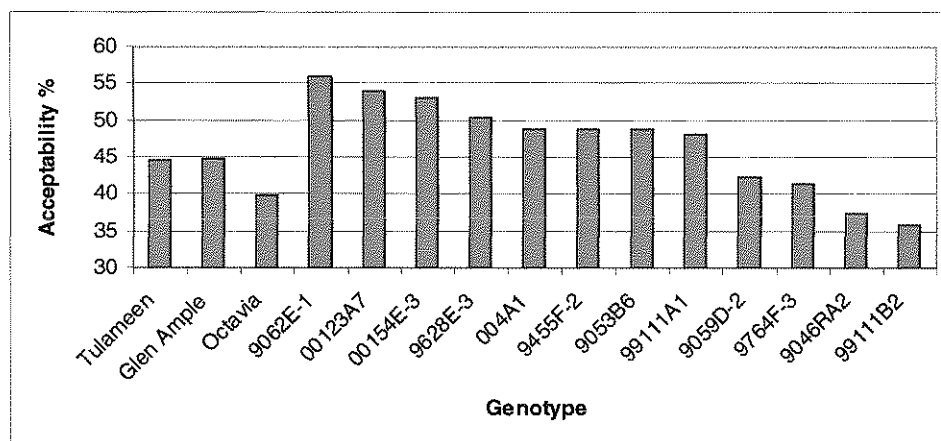
This year saw the first evaluation of the breeding material under a protected cropping system at SCRI. Three reps of sixty genotypes were planted in five-plant plots in spring 2004.

- Key selections from the plot, including selections already identified for on-farm trials are summarised in the table below.
- One new selection, 00123A7 was identified for on-farm trialling.

Genotype	Mean Yield/ Stool (g)	Mean Fruit Size (g)	Mean Brix %	Comments
00123A7	3153.6	4.7	9.6	Early-mid season. Aromatic and sweet throughout the season, pale, attractive conical fruit. Highest yield in plot.
9455F-2*	2282.0	7.0	9.7	Large conical fruit which kept a good size throughout the season. Variable flavour, better at end of season.
004A1	2420.6	4.1	11.0	Attractive, round fruit. Good yield over a long season, but fruit size declined quickly.
00154E-3	1981.2	3.7	9.6	Early season. Very glossy and attractive fruit, pleasant flavour, juicy, very upright habit
0039F-2	1076.8	4.8	7.7	Very pale fruit, aromatic, floral and sweet, very poor plant habit
99111A1*	1519.9	5.0	10.1	Putative root rot resistance Acceptable flavour, poor yield over a short season
99111B2*	1924.8	5.2	8.0	Putative root rot resistance Large fruit, poor flavour when fresh
9059D-2*	1940.2	5.3	9.4	Early-mid season. Very poor quality fruit with poor flavour, doesn't perform well under polythene
9612F2*	1065.2	8.0	8.1	Mid season. Large, round meaty fruit, flavour improved towards the end of a short season
9751E-2*	1039.7	4.6	9.4	Mid season. Large, meaty fruit, poor flavour, poor plant habit, lot of tip fruit, poor establishment this year
9455E3*	1781.9	5.4	7.3	Early-mid season. Large, conical fruit, poor flavour until end of season
9451D4*	1426.1	4.9	10.2	Mid-late season. Attractive round fruit which keeps its size, flavour improved at end of season, v. juicy.
Glen Ample	2985.9	5.0	10.1	Mid season. Good fruit quality & yield, large fruit all season, flavour picked up mid pick
Tulameen	825.2	4.8	10.3	Mid-late season. Attractive, bright & conical, poor yield due to poor establishment

Evaluation of Sensory Characteristics

For the second consecutive season, fruit samples were sent to for sensory profiling at Charis Innovative Food Services in Ayrshire, where flavour and quality are evaluated by a professional taste panel. These results give an objective evaluation of flavour and other sensory characteristics. Various descriptors are scored for taste, appearance, mouthfeel and aftertaste and an overall score of 'Acceptability' is given as a percentage. The figure below illustrates the mean acceptability over the 2005 season, showing that most of the advanced selections identified were superior to Glen Ample and Tulameen in terms of sensory characteristics, including flavour.



Action Points for Growers

- Assessment of 9053B6 as a possible new raspberry cultivar.
- Assessment of 9062E-1 as a possible new raspberry cultivar.
- Micropropagation of selection 00123A7, identified at SCRI this season as highly promising, for 2006 on-farm trials.

Science Section

Introduction

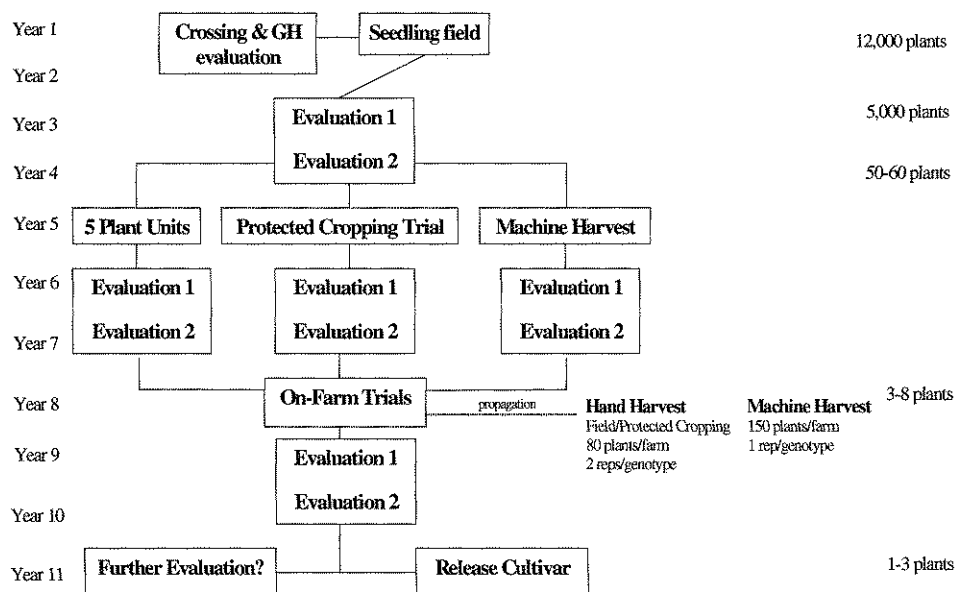
Raspberries have been bred at Mylnefield since the 1950's and the development of cultivars crucial to the industry's prosperity has continued at SCRI to the present time. The raspberry breeding programme at SCRI has been phenomenally successful and is perhaps best known for the 'Glen' series of cultivars which are grown throughout the world (Jennings and Brennan 2002).

Commercial funding between 1993 and 2000 saw the breeding programme focus upon the development of machine harvestable cultivars for processing. However, it is the fresh market sector that now represents the main area for potential growth in both field and season extension contexts. Although machine harvestable types are still under development, the primary focus is on the fresh market, selecting and developing cultivars suitable for production under a protected cropping system. This will help in identification of adapted germplasm early in the selection process, prior to commercial trialling.

Materials and Methods

The programme is based on recurrent selection. Each year selections are made which form the basis of the next generation of crossing. As new variability for particular traits is needed, elite cultivars and selections from outside the programme are included as parents. Each year, approximately 100 crosses are made, producing 100-200 seedlings per family. With variation in germination rates, the programme begins with ~12,000 seedlings. Based on their pedigree, families will be segregating for different characteristics.

Figure 1 Breeding Schedule



Crossing

All hybridizations in the programme are made out of season in an insect-proof glasshouse. Parents for hybridisation are identified and lifted in late autumn and given a chilling period of 7 weeks at 2°C in a vernalisation room, after potting on into 15 litre pots with a peat-based compost mix. The plants are then moved into an insect-proof glasshouse where the temperature is raised gradually from 10°C to 20°C over a three week period. Daylength is set at 16 hours. Plants break bud, produce laterals and begin to flower approximately four weeks later. Irrigation and fertigation are automated through a DI16 Dosatron.

Open flowers are collected into a Petri-dish for use as a pollen source, dried at room temperature and stored with a desiccant at 4°C. Closed flower buds are emasculated with a scalpel and are ready to pollinate once the stigma have become receptive (approx. 48 hours after emasculation). The pistil is pollinated with an artist's paint brush (Sable, size 5). All tools and hands are sterilized with absolute alcohol between crosses and all excess flower buds are removed to minimize pollen transfer in the glasshouse environment, therefore pollen bags are not required. Parent plants are sprayed for pests and diseases as appropriate for the duration of crossing.

Seed extraction

Fruit from each family is collected when ripe and left in a Pectinase solution overnight at room temperature. The pulp is separated from the seed by blending the mixture for 10 seconds in a domestic blender. The mixture is left to settle for one minute; viable seed will sink to the bottom and pulp and non-viable seed will float to the top. The pulp is decanted from the viable seed. The seed is rinsed by filling the jug with tap water, leaving to settle and decanted. The rinse cycle is repeated three times, until the tap water is clear. The seed which is clean and free of any pulp, is left to dry overnight on filter paper. Dry seed are stored in glassine bags (100 x 70mm) with a desiccant at 4°C.

Seed scarification

Up to 1000 seed/family are scarified in acid, assuming 15-20% germination. Remaining seed is stored in case of poor germination.

Seed must be clean and dry before scarification in acid. Seed is transferred to a boiling tube (~500 seed/tube) with concentrated sulphuric acid for exactly 20 minutes. Seed is rinsed by pouring the seed and acid through a metal sieve, secured by a retort stand, and rinsing with tap water for 10 minutes. Seed should be submerged under the water during this period. Seed is then submerged in calcium hypochlorite solution for 6-10 days. Seed should be stirred every day and the solution should be changed once during this period. Once the seed coat has been scarified with acid, it is important that the seed is not left to dry out.

Stratification and germination

Seed is rinsed under tap water for 10 minutes and mixed with damp vermiculite. The mixture is stored in a sealable bag at 4°C for six weeks. After this period, the seed and vermiculite is treated with GA₃ (3ppm) and left at room temperature overnight. The seed and vermiculite is sown onto Bulrush Brown/Black peat in a seed tray and covered with a fine layer of dry vermiculite. The trays are incubated at 20°C constant in corex

incubators, specially constructed at SCRI, to maintain heat and humidity. Seeds begin to germinate within 7 days.

Spines

Spined genotypes are eliminated early at the germination stage of the seedlings. The spine glands can be seen around the leaflets at the cotyledon stage. These are removed from families which are segregating for spines, leaving only the spine-free plants for further evaluation. All progeny are kept from crosses where plants are expected to be all spiny, due to the parents used.

Aphid Resistance

Seedlings in the breeding programme are screened for the gene *A₁₀*, conferring resistance to four biotypes of the large raspberry aphid (*Amphorophora idaei*). After the segregating families are screened for spineness, the remaining seedlings are pricked out and potted-on into FP9 pots with compost mix containing slow release fertilizer. These are reared in a glasshouse with a 16 hour day length at 20°C. Once plants have produced 3-4 true leaves, they are ready to be inoculated with biotype two of *A. idaei*. Two apterous *Amorphora idaei* aphids are placed on each test plant alongside controls Malling Jewel (susceptible) and Autumn Bliss (resistant). The plants are scored after 10-14 days; susceptible plants will have a feeding colony versus resistant plants which will have no reproducing population. Susceptible progeny in segregating families are discarded. Aphids are cultured and supplied by entomologists on-site at SCRI.

Field planting

After spiny and aphid-susceptible genotypes are eliminated, the remaining seedlings (~5000 individuals) are hardened-off for field planting. If the ground conditions are appropriate the seedlings are planted in late autumn, otherwise they are held in a Tygan structure until the following spring. This is a 9m, semi-permanent single-span tunnel, covered with an insect-proof mesh, instead of polythene. Seedlings are planted 0.8m apart, with a 0.8m gap between families.

All outdoor raspberry breeding plantations at SCRI are prepared and managed with the same practice. Raised beds are formed, 2.5m apart, with a potato bed-maker. Grass seed is sown in the alleyways. Plants are supported with a traditional post and wire system and old floricanes are cut out and new primocanes are laced-in in the traditional manner. Overhead irrigation is supplied as needed. A minimal spray programme is applied as follows in order to select for resistance/susceptibility to pathogens.

Pest/Pathogen	Control (Active ingredient)	Rate/ha	Application
Weed control	Pendimethalin	5L	February
Root rot	Fluazinam	1.5L	Spring and autumn
Cane midge	Chlorpyrifos	1L	May
	Activator 90 (adjuvant)	0.5L	May
Raspberry beetle	Chlorpyrifos	1L	First open flowers

Breeding and selection for tolerance to raspberry root rot

An important objective of the breeding programme the development of cultivars with tolerance to raspberry root rot, caused by the fungus *Phytophthora fragariae* var. *rubi*. Currently, 20% of the crossing programme is dedicated to breeding for tolerance to the disease, where one parent with known resistance or tolerance is crossed with genotypes with good agronomic characteristics. Progeny are planted alongside susceptible controls in an infestation plot at SCRI. Seedlings are evaluated once these controls show symptoms of root rot, usually around 3-5 years after planting. Tolerant selections require further evaluation for fruit quality and yield before a cultivar can be released.

First stage selection

These plants are evaluated for two fruiting years for basic fruiting characteristics (size, shape, flavour, colour, firmness, shelf life). Around 1% of the seedlings (30-50 individuals) are selected for small replicated trials of protected hand harvest plots and, where appropriate, machine harvest plots at SCRI. Once selected, root from these genotypes are lifted from the plot and given a six week vernalisation period at 4°C. Root from each selection is then sown into a shallow tray on top of Bulrush compost and germinated with bottom heat in a glasshouse set at 20°C, 16 hours daylength. These are evaluated for a further three fruiting years, alongside commercial cultivars, where more detailed assessments are made on fruit quality, yield, plant habit and tolerance to pest and disease.

SCRI Polytunnel

One hectare of Haygrove polytunnels were constructed at SCRI in 2004 to evaluate germplasm under a protected cropping system with the objective of identifying suitable cultivars early in the selection process. The 100m x 100m structure is a Spanish-style Haygrove SMART series multi-bay tunnel with thirteen bays, each spanning 7.8m, built on 2m legs. Tunnels are covered with standard 150mu Visqueen polythene. Raspberry tunnels have three rows per bay, 2.5m between rows with a 2.8m leg row. Alleyways were grassed and legs rows covered with UV-stable fabric mulch (Phormasol) to control weeds. Raised beds were covered 90mu Black/White bedding polythene. Irrigation and fertigation is controlled by a D8 Dosatron and is fed through Ram Light tape under the bedding polythene. A commercial fertigation programme, standard for established plots of Glen Ample and Tulameen, is used:

	Rate (kg/ha/week)	Start date	Duration
13-5-30 + 3.2MgO	25	May	16 weeks
Potassium nitrate	25	June	8 weeks

A 4m high Paraweb windbreak is erected on the west side of the tunnels to protect the structure from wind damage.

Plant material

Selections from the breeding programme are planted in replicated five-plant plots. Plants are placed at 0.8m spacing with a 0.8m gap between each genotype, giving two genotypes

between each post. A continuous row of Glen Ample was planted in the westernmost row of the raspberry plot as a guard.

Plants are supported with a post and wire system. A double post system is erected at row ends and mid-row to give extra support. Wire support is put in a three heights since there is large diversity between genotypes of establishment and vigour.

Chemical application

Generally, breeding plots at SCRI are kept free of chemical application to assess resistance/susceptibility of pest and disease. After discussions in 2004, it was felt that the protected plots of raspberries should be kept free of any pathogens in order to observe optimum fruit quality and yield. The basic spraying programme is below. Additional applications will be based on observations and presented in the Results section.

Pest/Pathogen	Control (Active ingredient)	Rate/ha	Application
Root rot	Fluazinam	1.5L	Spring and autumn
Raspberry beetle	Chlorpyrifos	1L	First open flowers
Two spotted spider mite	Spidex (<i>Phytoseiulus persimilis</i>)		Fruit season

Assessments

Several physical fruit quality characteristics are assessed on an arbitrary score of one to nine, where one equals poor or low intensity and nine equals excellent or high intensity, as follows:

Characteristic

Flavour	1 = bad/off flavour	9 = fruity + aromatic with a balance of sweet/acid
Shape	1 = globular	9 = long conic
Colour	1 = v. pale	9 = v. dark/purple
Firmness	1 = v. soft	9 = v. firm
Collar	1 = v. uneven	9 = v. even with good cohesion
Pick	1 = v. difficult to plug	9 = falls off when touched
Vigour	1 = low vigour <1m	9 = v. vigorous >3m
Plant habit	1 = collapsed cane	9 = v. upright cane
Cane diseases	1 = no symptoms	9 = severe symptoms
Overall score	1 = completely inadequate	9 = perfect agronomical traits

- Total yield for each five-plant plot is picked and calculated as yield per stool.
- Fruit size is measured in grams by taking the average weight of ten fruit.
- Season is assessed by recording dates of first flower, first fruit, first pick, 50% pick and final pick.
- Number of fruit per lateral is counted on laterals from the top, middle and bottom of the plot.
- Brix is measured with a Palette 100 PR-100 digital refractometer.
- Fruit from the most promising selections are sent to a professional sensory panel at Charis, Ayr, for profiling.

- Additional notes are recorded on flavour description, uniformity, display, comparison with control varieties, disease infection and other identifying features.

Advanced Selections

All the fruit data is collated and promising selections (usually one or two genotypes) with consistent desirable characteristics are identified as potential new cultivars, and are thus candidates for on-farm trials. Once permission has been given by the executive committee, vegetative buds are micropropagated to provide root rot-free plants to growers. This is initiated by growing primocane from root harvested in late autumn from the SCRI field trial, vernalised and propagated as the root from the 'First stage selection'. Vegetative buds are initiated into micropropagation in the following spring to produce modules for field planting 12 months thereafter.

Pathogen-testing is initiated at this time to produce indexed mother stock in anticipation of commercialisation. This requires a minimum of one year, providing the plant material is at an appropriate growth stage. The mother plants must be free of all pathogens listed in the declaration, under E.P.P.O guidelines, to enter to certification scheme. Fully-tested mothers are held until a decision is made to release or discard these advanced selections.

The plants are distributed to growers within the Consortium and are trialled on diverse geographical sites and cultivation methods next to commercial cultivars for comparison. These trials are evaluated for at least two fruiting years. Growers are requested to fill out a single page 'Raspberry Trial Results Form', detailing plant establishment, cultivation and comparing the advanced selection with a control cultivar for various characteristics. The growers provide valuable feedback on how the selection performs on a commercial trial. If these advanced selections are superior to existing commercial cultivars, they will undergo commercialisation.

Results and Discussion

2005 Crossing Programme

This year, 86 crosses were made at SCRI, targeting fruit quality, season extension, low chill requirement and pest and disease resistance (see Appendix, Table 5). Approximately 9,000 seedlings were generated which are currently being screened in the glasshouse for absence of spines and resistance to aphids. Remaining plants will be planted outside in spring 2006 and fruit from these seedlings will be evaluated initially in 2007.

Breeding Trials at SCRI

Protected Cropping Site

This year saw the first evaluation of the breeding material under a protected cropping system at SCRI. Three reps of sixty genotypes were planted in five-plant plots in spring 2004.

Although the planting material was a standard size, there was variation in establishment in terms of primocane number and vigour. Efforts were made to cultivate the germplasm as close to a commercial system as possible. This was a challenge as such diversity in a

small area made uniformity of spraying and feeding more difficult to achieve. The spraying programme is detailed in Table 1.

Table 1 SCRI protected cropping trial J8 - Spray programme 2005

Date	Product name	Active Ingredient	Rate/Ha	Notes
01/04/2005	Shirlan	Fluazinam	1.5L	Root Rot
04/05/2005	Paraquat	Paraquat	5L	Weeds
13/05/2005	Chlorpyrifos	Chlorpyrifos	1L	Cane Midge
13/05/2005	Non Ionic Wetter	Ethylene Oxide Condensate	0.5L	Cane Midge
24/05/2005	Aphox	Pirimicarb 500g/kg	0.28kg	Aphids
31/05/2005	Equity	Chlorpyrifos	1L	Raspberry beetle
01/07/2005	Nemasys	(predatory nematode)	5 billion	Vine Weevil
29/07/2005	Spidex	(predatory mite)		Two spot spider mite
01/08/2005	Spidend	(predatory midge)		Two spot spider mite
30/08/2005	Apollo	Clofentezine 500g/litre	0.4L	Two spot spider mite
30/08/2005	Thianosan	Thiram	2kg	Fungicide
15/09/2005	Decis	Dectamethrin	1L	Aphicide
20/09/2005	Equity	Chlorpyrifos	2L	Vine Weevil
20/09/2005	Shirlan	Fluazinam	0.3L	Root Rot

The tunnel was covered in mid June 2005 and picking started in the first week of July and continued into mid-August.

The trial was hand-picked for yield and basic fruit quality characteristics were evaluated; size, shape, colour, firmness, flavour, shelf life and brix. There was little diversity of season between the selections, the earliest selections starting around the same time as Glen Moy and none of the selections started later than Tulameen, although many had a longer season than the cultivar.

Brix levels were generally low for all of the genotypes, including the controls and only improved slightly as the season progressed. Brix level didn't appear to correlate well with flavour e.g. the popular selection 00123A7 had good flavour throughout the season, but the brix results were relatively low.

Total yield for each plot can be found in the Appendix, Table 6. This data is summarised as average yield per plant in Table 7 of the Appendix. Since there was variation in cane growth in 2004, establishment was noted as an arbitrary score of one to five, where one is poor establishment (growth reached the bottom wire) and five is good (growth reached the top wire). Table 8 of the Appendix ranks the selections by fruit quality and summarises their performance throughout the season.

Key selections from the plot, including selections already identified for on-farm trials are summarised in Table 2.

Table 2 Summary of characteristics of key selections

Genotype	Mean Yield/ Stool (g)	Mean Fruit Size (g)	Mean Brix %	Comments
00123A7*	3153.6	4.7	9.6	Early-mid season. Aromatic and sweet throughout the season, pale, attractive conical fruit. Highest yield in plot.
9455F-2*	2282.0	7.0	9.7	Large conical fruit which kept a good size throughout the season. Variable flavour, better at end of season.
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9059D-2*	1940.2	5.3	9.4	Early-mid season. Very poor quality fruit with poor flavour, doesn't perform well under polythene
9612F2*	1065.2	8.0	8.1	Mid season. Large, round meaty fruit, flavour improved towards the end of a short season
9751E-2*	1039.7	4.6	9.4	Mid season. Large, meaty fruit, poor flavour, poor plant habit, lot of tip fruit, poor establishment this year
9455E3*	1781.9	5.4	7.3	Early-mid season. Large, conical fruit, poor flavour until end of season
9451D4*	1426.1	4.9	10.2	Mid-late season. Attractive round fruit which keeps its size, flavour improved at end of season, v. juicy.
Glen Ample	2985.9	5.0	10.1	Mid season. Good fruit quality & yield, large fruit all season, flavour picked up mid pick
Tulameen	825.2	4.8	10.3	Mid-late season. Attractive, bright & conical, poor yield due to poor establishment

*Selections currently identified for on-farm trials

On-Farm Trials

This year, the following selections were evaluated on growers' trials in the UK.

9053B6
9062E-1
9046RA2
9050RD3
9059D-2

These selections have performed exceptionally well on small trial plots at SCRI over the last six years and were identified for trialling on commercial farms in 1999. Plants were micropropagated at SAC in Edinburgh and planted out, in 2002 and 2003, on diverse sites

throughout the UK, including outside and protected cropping trials and, where appropriate, machine harvested trials (see Appendix, Table 9). 2004 saw these trials fruiting for the first time. Below is a summary of the performance of each selection. Growers' comments can be found in the Appendix.

9053B6

This late season selection was originally selected for its superior machine harvest characteristics but its sensory traits, in particular good flavour, have proved it an excellent selection for the fresh market. At SCRI 9053B6 has outperformed Glen Ample in terms of yield, fruit quality and flavour for the last six years. This selection had the highest yield in the HDC trial in Oxford in 2004 and 2005. Fruit from this trial was sent to various supermarket taste panels in England during the season, where this selection generated positive interest. Canes are easy to manage due to their upright habit and absence of spines. This selection is consistent and robust and this year's data supports the decision to release 9053B6 as a cultivar.

9062E-1

This selection was identified for on-farm trials in 1996 under funding from Scottish Soft Fruit Growers. It was planted on three trial sites in 1999/2000. This selection was very promising but was dropped from the advanced selections at SCRI due to its fluctuating yield in the SCRI trials.

Two growers have continued their trials of 9062E-1 and have been highly impressed with its performance when harvested by machine. This selection was planted on the HDC trial site in Oxford in spring 2004, and produced a small crop this season. Although there were only a few plants in the trial, it proved a popular genotype in terms of quality and, in particular, flavour. 9062E-1 also generated very positive interest from several supermarket representatives. It should therefore be marketed as suitable for the fresh market in addition to its superior machine harvesting characteristics.

9050RD3

This selection is mid to late season and has large, firm conical fruit, bright and glossy in a punnet but flavour was considered poor. Laterals are long and primocane are very vigorous and tend to fall over and growers found this selection difficult to manage on farm trials both outside and under polytunnels. Some growers also mentioned that the primocane tended to have a 'twisting' habit. This habit makes 9050RD3 an unsuitable candidate for machine harvesting. Some growers didn't pick this selection at all this year due to either poor cane establishment in 2004 or poor fruit quality.

9046RA2

9046RA2 is a slightly darker fruited selection which harvests well by machine, picking little green or husk. Fruit is large firm and conical with good shelf life and freezing quality. Primocanes are very upright, growing through the middle of the plot, making fruit more accessible to pickers and also reduces damage by a machine harvester. Growers found this to be a good machine harvest selection but due to its' dark colour and variable flavour, was unsuitable for fresh. One grower found this selection to be infected

with crown gall, *Agrobacterium sp.* Other observations of 9046RA2 in on-farm trials include a higher susceptibility to cane spot than Glen Ample.

9059D-2

This is an early season selection, fruiting 5-7 days before Glen Ample. 9059D-2 was originally selected at SCRI for its large pale fruit, exceptional flavour and outstanding yield. The compact cane habit with strong upright laterals suggested that it would be ideal for tunnel production and the fresh market. However, in the last two seasons on growers' trials, this selection has performed poorly. Under protection and in the HDC trial, 9059D-2 had uneven, irregular fruit which made it unattractive in a punnet. At SCRI this year, the flavour was only acceptable at best. This selection is susceptible to the large raspberry aphid. 9059D-2 is unsuitable for machine harvesting.

New On-Farm trials

Selections identified in 2001 and 2002

Table 3 Selections identified for on-farm trials 2001/02

Selection	Attributes
9455F-2	Hand pick
99111A1	Putative <i>Phytophthora</i> tolerance
99111B2	Putative <i>Phytophthora</i> tolerance
9612F2	Machine pick
9751E-2	Machine pick
9451D4	Hand pick
9455E3	Machine pick

Table 3 lists the selections identified for on-farm trials in 2001/2002. These selections have been fruiting in traditional outside plots at SCRI for three years. This year, they fruited for the first time under the SCRI polytunnels. Table 2 describes a summary of their performance in this plot this season. From this group, the most promising selections, based on this year's results are 9455F-2 and 9612F2 for fruit quality and 99111A1 and 99111B2 for their putative tolerance to *Phytophthora*. The remaining selections from this group had poor results due to poor establishment or poor agronomic traits.

99111A1 and 99111B2

These sister selections were from crosses, made in 1999, targeting resistance to *Phytophthora*. Progeny from such crosses were planted in an infestation plot at SCRI in spring 2000 alongside the susceptible cultivar, Glen Moy. The plot started showing symptoms rapidly and in 2002 the controls had died from root rot. The families appeared to be segregating for the disease with an improved survival rate to previous breeding plots. Two selections, 99111A1 and 99111B2, were showing no symptoms of root rot despite adjacent plants dying off with severe symptoms. Early observations of the single plants demonstrated acceptable fruit quality. This led to a decision for early micropropagation for on-farm trials.

Both genotypes were also planted in a 'clean' site at SCRI to assess fruit quality and yield. These fruited their first crop this season and gave interesting results.

99111A1 had smaller fruit and a lower yield than B2. It has a very upright plant habit with spinefree canes. Flavour was superior to B2, although the Charis results showed it to be inferior to both Glen Ample and Tulameen but better than Octavia.

99111B2 had large attractive conical fruit and a slightly higher yield than A1. However, flavour was very poor when eaten fresh. This was supported by the Charis results which described B2 as 'bitter' and 'acidic'.

New selection 00123A7 identified for on-farm trials in 2005

This season, selection 00123A7 proved outstanding in the polytunnel plot at SCRI. It generated much interest from Consortium members and Institute visitors, including supermarket people, during the fruit season. This is an early-mid season summer-fruiting selection which begins picking around 4-6 days before Glen Ample. Typically in the breeding programme, selections would be identified for on-farm trials after the fruiting season and buds would be sent for micropropagation in the following spring from root material lifted during the winter. A summary sheet was sent to the Executive Committee in late July requesting permission to micropropagate this selection for on-farm trials. 00123A7 was sent to Charis for sensory evaluation and performed well against Glen Ample and Tulameen.

Buds of 00123A7 were sent to both Hargreaves Plants and Gentech in late July and early August respectively, with the intention of producing plants for spring 2006.

Micropropagation of new on-farm trials

Selections identified in 2001 and 2002

Selections 9059D-2, 99111B2, 99111A1, 9612F2, 9455F-2, 9451D4 and 9751E-2 were sent out to growers' trials in 2005 (see Table 11).

Plant 1 of selection 9059D-2 tested positive for black raspberry necrosis virus (BRNV) and was withdrawn from propagation at Gentech in September 2005. No plants derived from this clone were sent out to growers.

Selections identified in 2004

Buds of the two genotypes, 9628E-3 and 9764F-3, selected in 2004 were sent to Hargreaves for micropropagation in early June with the goal of producing plants in spring 2006.

Selection identified in 2005

Buds of selection 00123A7 were sent to Hargreaves and Gentech in summer 2005 with the goal of producing plants in spring 2006.

Table 4 indicates the progress of the selections undergoing full disease testing.

Table 4 Selections undergoing virus indexing

Selection	Progress of pathogen testing	Indexed root available
9053B6	Fully tested. Material in high health house	2006 (6 mothers)
9059D-2	Fully tested. Material in high health house	2006 (4 mothers)
9046RA2	Re-initiation from micropropagated plants in 2006	Expected 2007
9050RD3	Re-initiation from micropropagated plants in 2006	Expected 2007
9062E-1	Awaiting results for entry into high health house	Expected 2006
99111A1	Re-initiation from micropropagated plants in 2006	Expected 2007
99111B2	Awaiting results for entry into high health house	Expected 2006
9612F2	Awaiting results for entry into high health house	Expected 2006
9455F-2	Awaiting results for entry into high health house	Expected 2006
9751E-2	Fully tested. Material in high health house	2006 (2 mothers)
9455E3	Initiation from micropropagated plants in 2006	Expected 2007
9451D4	Initiation from micropropagated plants in 2006	Expected 2007
9628E-3	Initiation from micropropagated plants in 2006	Expected 2007
9764F-3	Initiation from micropropagated plants in 2006	Expected 2007
00123A7	Initiation from micropropagated plants in 2006	Expected 2007

Charis results

For the second consecutive season, fruit samples were sent to for sensory profiling at Charis Innovative Food Services in Ayrshire, where flavour and quality are evaluated by a professional taste panel. These results give an objective evaluation of flavour and other sensory characteristics.

Fruit from the on-farm trials was compared with Glen Ample, Tulameen and Octavia. Comparisons between outside field plots and protected cropping systems were made. Two new SCRI selections 9764F-3 and 9628E-3 were also included in the trial. Fruit was harvested over three weeks and picked at supermarket ripeness and quality. Fruit was sampled from four trial sites, including SCRI (see Appendix, Table 10).

Key points from the Charis results:

- 9053B6 was outstanding in the trial, superior to Glen Ample and similar to Tulameen for flavour. 9053B6 was more 'fruity', 'sweet' and 'raspberry' and less 'bitter' and 'acid' than the cultivars.
- 9053B6 was firmer but less juicy than the cultivars.
- 9062E-1 had exceptionally good flavour throughout the season, scoring high for such attributes as 'fruity', 'sweet' and 'raspberry'.
- New selection 9455F-2 had firm fruit and a larger fruit size than the controls, but flavour was poor until the end of the season.
- New selections 9764F-3 and 9628E-3 performed well for flavour against both Glen Ample and Tulameen. Both selections had a larger fruit size than Tulameen.
- 00123A7 was 'sweet' for the duration of the season.

2006 Season

The following will be planted in autumn 2005/spring 2006:

- A new machine harvest plot of 30 genotypes.
- A demonstration plot of SCRI cultivars.
- Replicated five-plant plots under a protected cropping system.

The following will be evaluated in 2006:

- 60 genotypes in replicated five-plant plot under a protected cropping system at SCRI.
- 1000 seedlings, from crosses made in 2004, under a protected cropping system at SCRI.
- Approximately 8000 seedlings, from crosses made in 2002, 2003 and 2004 in traditional outside plots at SCRI.

Conclusions

- 9053B6 continued to be outstanding on growers' trials this year.
- High health root material of 9053B6 is bulked up at commercial propagators.
- 9062E-1 was superb in both machine and fresh trials.
- 9050RD3 performed poorly in trials in 2004 and 2005 and is recommended for rejection.
- 9046RA2 performed well as a machine harvesting type, but is inferior to both 9053B6 and 9062E-1 in terms of yield, quality and disease tolerance, and is recommended for rejection.
- New trials will be evaluated in 2006, both on-farm and SCRI.
- One new selection, 00123A7 was identified for on-farm trialling.
- Three new selections will be available to plant on-farm trials in spring 2006.

Technology Transfer

- A presentation of the project was given at the following events:
 - New Developments in the Soft Fruit Industry, ADAS conference, 23rd November 2004, Ashford.
 - SSCR Fruit Event, 'Fruit for the Future', July 14th 2005, SCRI.
- SCRI is currently developing a soft fruit portal, funded outwith the Consortium, for researchers, growers, advisors and end users. It is envisaged that separate pages with restricted access within the portal will subsequently be available to specific interest groups, including the breeding Consortium. The portal will be going 'live' in November 2005.

Glossary

Cotyledon	The embryonic leaf of a seed.
Crossing	The mating of individuals of different genotypes of the same species in order to promote genetic recombination.
Emasculation	The removal of male reproductive organs.
Genotype	An individual with a unique genetic constitution.
Pistil	The female reproductive structure of a flower, consisting of ovary, style and stigma.
Progeny	The resulting offspring of a cross.
Seed scarification	The physical disruption of the seed epidermis.
Seed stratification	The exposure of seeds to extended cold periods prior to germination at warm temperatures.
Stigma	The surface of a pistil upon which the pollen grains germinate.
Vernalisation	A process of thermal induction in plants, in which growth and flowering are promoted by exposure to low temperatures.

References

Jennings, S.N., Brennan, R. 2002. Improvement of raspberry cultivars in Scotland. *Acta Horticulturae* 585: 179-183.

Lincoln, R.J., Boxshall, G.A., Clark, P.F. 1982. *A dictionary of ecology, evolution and systematics*. Cambridge University Press.

APPENDIX: 1

Selections in the right-hand column indicate the mother parents. Selections across the top row indicate the pollen parents. Numbers within the table indicate where hybridisations are made eg, number 1 = family 1 from crosses made in 2005 and progeny from this cross will be named '0501' (8844L-3 x 9350F3).

Table 6 SCRI Polytunnel site J8, Yield, Season and Establishment 2005

Selection	Row	Post	First Flower	No. of fruit/Late	1st Pick Date	Last Pick Date	Total (g)	No. of stools	Establishment	Yield/Stool (g)
0031B-2	2	A	30/5		15/07/05	08/08/05	770	3	1	256.7
99105RD-4	2	A	30/5	18	08/07/05	11/08/05	3060	2	5	1530.0
9908B-1	2	B	23/5	16	05/07/05	11/08/05	4039	5	2	807.8
9455F-2	2	B	23/5	10	08/07/05	11/08/05	8961	4	5	2240.3
9046RA2	2	C	30/5	15	11/07/05	02/08/05	1931	4	3	482.8
9059D-2	2	D	20/5	13	04/07/05	11/08/05	14052	5	5	2810.4
GLEN MOY	2	D	10/5	11	04/07/05	05/08/05	16109	5	5	3221.8
9451G5	2	E	26/5	39	05/07/05	11/08/05	11175	5	4	2235.0
99105RC-2	2	E	26/5	17	08/07/05	08/08/05	3913	5	4	782.6
99105B7	2	F	30/5	22	05/07/05	11/08/05	5434	4	4	1358.5
99106D3	2	F	20/5	26	11/07/05	11/08/05	3833	3	4	1277.7
00154E-3	2	G	23/5	10	04/07/05	11/08/05	11721	5	5	2344.2
003RA7	2	G	4/5	8	04/07/05	02/08/05	7487	3	4	2495.7
NZ91326RLD-4	2	H					171	2	1	85.5
99111A1	2	H	23/5	16	05/07/05	02/08/05	7648	5	5	1529.6
9069E-2	2	I	26/5		11/07/05	08/08/05	3866	3	2	1288.7
DJ1185	2	I					153	4	1	38.3
NZ91359RC-1	2	J	17/5				0	4	1	0.0
003A8	2	J	23/5				117	2	1	58.5
0015F1	3	A	30/5	8	11/07/05	11/08/05	10829	5	5	2165.8
0039F-2	3	A	30/5	18	11/07/05	05/08/05	1227	3	2	409.0
9451E2	3	B	30/5		11/07/05	05/08/05	1753	4	2	438.3
004A1	3	B	26/5	25	08/07/05	11/08/05	13124	4	5	3281.0
0019F12	3	C	20/5	13	05/07/05	05/08/05	2407	1	5	2407.0
9601C-1	3	C	17/5	15	05/07/05	02/08/05	5329	3	3	1776.3
9908A2	3	D	30/5		11/07/05	05/08/05	2058	3	2	686.0
9751E-2	3	D			11/07/05	28/07/05	627	1	2	627.0
GLEN AMPLE	3	E	30/5	19	08/07/05	08/08/05	6241	3	5	2080.3
99111B2	3	E	20/5	15	05/07/05	05/08/05	7789	5	4	1557.8
00154D-4	3	F	26/5		11/07/05	05/08/05	835	2	1	417.5
NZ91319RJA-7	3	F	30/5		05/07/05	05/08/05	422	5	1	84.4
0019E2	3	G			15/07/05	05/08/05	756	1	1	756.0
0096RF-6	3	G	26/5	20	11/07/05	11/08/05	6985	5	3	1397.0
9455E3	3	H	23/5		05/07/05	11/08/05	5939	5	2	1187.8
00100C6	3	H	23/5				383	3	1	127.7
004B1	3	I	30/5		15/07/05	05/08/05	472	3	1	157.3
TULAMEEN	3	I		10	19/07/05	11/08/05	2320	4	5	580.0
GLEN ROSA	3	J	26/5	14	11/07/05	11/08/05	9142	4	5	2285.5
00123A7	3	J	20/5	23	05/07/05	11/08/05	14160	5	4	2832.0
00152F-2	4	A	23/5	15	05/07/05	08/08/05	8034	4	5	2008.5
9901B-3	4	A	26/5				527	4	1	131.8
9673E4	4	B	20/5	7	05/07/05	02/08/05	4630	5	2	926.0
99105B-1	4	B	30/5	26	11/07/05	08/08/05	4633	5	3	926.6
0081G-2	4	C	30/5		08/07/05	02/08/05	2034	2	1	1017.0
NZ91330LL72	4	C	3/6				0	1	1	0.0
9653RF-4	4	D	30/5	16	08/07/05	08/08/05	8270	5	3	1654.0
EM6490/95	4	D	30/5				0	1	1	0.0
GLEN PROSEN	4	E	26/5	16			3114	5	5	622.8
9612F2	4	E	23/5	13	05/07/05	05/08/05	6303	5	3	1260.6
9451D4	4	F	30/5	20	11/07/05	08/08/05	3718	4	4	929.5
0015B3	4	G					0	5	1	0.0
9911C-1	4	G	23/5	17	04/07/05	08/08/05	2992	3	3	997.3
0030E-12	4	H	30/5	20	11/07/05	05/08/05	1153	4	3	288.3

Table 7 SCRI polytunnel site J8 - Mean Yield (ranked highest to lowest)

Selection	1st Pick Date	Last Pick Date	Establishment	Mean Yield/Stool (g)
00123A7	05/07/2005	11/08/2005	5	3153.6
0082B5	08/07/2005	08/08/2005	5	3110.3
GLEN AMPLE	08/07/2005	08/08/2005	4	2985.9
0019F12	05/07/2005	05/08/2005	5	2957.4
004A1	08/07/2005	11/08/2005	5	2850.8
003RA7	04/07/2005	02/08/2005	4	2495.7
9601C-1	05/07/2005	02/08/2005	4	2466.5
00152F-2	05/07/2005	08/08/2005	5	2455.8
GLEN ROSA	11/07/2005	11/08/2005	5	2376.3
9455F-2	08/07/2005	11/08/2005	4	2282.2
GLEN MOY	04/07/2005	05/08/2005	4	2271.4
9451G5	05/07/2005	11/08/2005	4	2235.0
0015F1	11/07/2005	11/08/2005	5	2165.8
00154E-3	04/07/2005	11/08/2005	5	1981.2

Selection	1st Pick Date	Last Pick Date	Establishment	Mean Yield/Stool (g)
9059D-2	04/07/2005	11/08/2005	4	1940.2
99111B2	05/07/2005	05/08/2005	4	1924.8
9455E3	05/07/2005	11/08/2005	2	1781.9
99105RD-4	08/07/2005	11/08/2005	5	1590.9
99111A1	05/07/2005	02/08/2005	5	1519.9
9451D4	11/07/2005	08/08/2005	4	1426.1
9908B-1	05/07/2005	11/08/2005	3	1321.7
99106D3	11/07/2005	11/08/2005	3	1317.7
9069E-3	11/07/2005	08/08/2005	2	1288.7
0096RF-6	11/07/2005	11/08/2005	3	1229.0
99105B7	05/07/2005	11/08/2005	3	1066.2
99105B-1	11/07/2005	08/08/2005	3	1065.6
9612F2	05/07/2005	05/08/2005	3	1065.2
9751E-3	08/07/2005	11/08/2005	2	1039.7
9653RF-4	08/07/2005	08/08/2005	2	1035.0
0039F-2	11/07/2005	05/08/2005	3	854.2
TULAMEEN	19/07/2005	11/08/2005	5	825.2
0081G-2	08/07/05	02/08/2005	1	796.8
99105RC-2	08/07/2005	08/08/2005	4	779.1
0019E3	15/07/2005	05/08/2005	1	756.0
0031B-2	15/07/2005	08/08/2005	1	657.1
9911C-1	04/07/2005	08/08/2005	3	628.4
GLEN MAGNA	22/07/2005	11/08/2005	5	622.9
GLEN PROSEN			5	600.4
9046RA2	11/07/2005	02/08/2005	3	482.8
MALLING LEO	15/07/2005	12/08/2005	4	477.8
9673E4	05/07/2005	02/08/2005	1	457.4
9908A2	11/07/2005	05/08/2005	2	439.1
004B1	15/07/2005	05/08/2005	1	408.1
3E-11	11/07/2005	05/08/2005	3	400.7
JULIA	19/07/2005	11/08/2005	3	317.0
9451E3	11/07/2005	05/08/2005	1	296.0
ALL GOLD	12/07/2005	27/07/2005	3	283.8
00154D-4	11/07/2005	05/08/2005	1	266.2
9901B-3	15/07/2005	11/08/2005	1	154.1
00100C6			1	127.7
003A8			1	58.5
0015B3			1	0.0
AUTUMN BLISS			*	0.0
DJ1185			1	0.0
EM6490/95			1	0.0
JOAN J			*	0.0

Selection	1st Pick Date	Last Pick Date	Establishment	Mean Yield/Stool (g)
NZ91319RJA7	05/07/2005	05/08/2005	1	0.0
NZ91326RLD-4			1	0.0
NZ91330LL72			1	0.0
NZ91359RC-1			1	0.0
NZ91359RJA-7			1	0.0

Table 8 SCRI Polyunnel J8 - Summary of arbitrary scores and comments

Selection	Mean Fruit Size (g)	Mean Brix %	Fruit shape	Fruit Colour	Pick	Collar	Firmness	Flavour	Cane Position	Pubescent Cane	Overall selection score	Secondary Laterals	Notes
00123A7	4.7	9.6	8	4	8	8	7	8	9		8	*	earlier than ample, good crop, good flavour - sweeter than Ample through season, keeps flavour until end of season, v. upright primocane. Tip fruit? big drupes, great flavour mid and late season, mildew infection in august, severe aphid infestation
GLEN AMPLE	5	10.1	5	5	7	6	6	6	7	*	7		Very glossy & attractive & aromatic through season, tears when picking
00154E-3	3.7	9.6	7	4	5	8	8	6	8		6		Pale, bit dull, large meaty, conical. Slightly acid for most of season but improves at end, keeps large fruit size over a long season
9455F-2	7	9.7	8	3	6	7	7	5	8		6		Small & very glossy, sweet & aromatic, goes smaller at end of season
9673E4	4.6	7	5	5	8	9	5	6	8	*	6		not much flavour in beginning - develops later into sweet & aromatic but not much juice, bright fruit, bit blotchy 2nd half of season, upright primocanes
0015F1	4.7	10.4	6	5	8	7	6	4	8		6		mild flavour but sweet and pleasant, low vigour, round attractive berries, fruit gets smaller over a long season
004A1	4.1	11	5	5	8	8	7	6	6	*	6	*	Good flavour, sweet & aromatic. Bit soft early in season
9911C-1	5.8	10.2	5	5	7	7	6	8	6		6		large, meaty, attractive, slightly dull, poor flavour for most of season - improves in august, collapsing primocane, poor habit
9455E3	5.4	7.3	8	5	6	7	7	5	3		6		Dark & very attractive, glossy, some aroma - probably too dark
9069E-2	4.9	10.1	6	7	8	6	6	4	8	*	5	*	Meaty, glossy. Like 9062E-1.
0019E2	5.0	9.6	5	5	7	8	6	4	6		5		Nice flavour - better in august, variation in fruit shape - some crumble at beginning
003RA7	5.3	7.3	6	6	7	8	7	6	7	*	5		"Patio" raspberry. Primocane at mid-wire. Short internodes, very branchy & compact.
004B1	4.7	9.1	5	3	8	7	3	4	8		5		Attractive, small but meaty, some flavour, early fruit is soft, glossy, no juice, compact primocane
0081G-2	3.5	7.4	5	5	7	9	5	5	8		5	*	Small, glossy, bit blotchy, some flavour, longs laterals, v. upright primocane, some branching
9451G5	4.6	9	5	6	7	7	7	4	9	**	5		sun scorch early season, very glossy, attractive, hairy fruit, some mildew, bland for most of the season
9653RF-4	5.2	9.4	8	6	6	8	8	5	8		5		Slightly acid through season, but ok, small at end of season, v. upright cane
99111A1	5	10.1	6	5	7	7	5	4	9		5		

Selection	Mean Fruit Size (g)	Mean Brix %	Fruit shape	Fruit Colour	Pick	Collar	Firmness	Flavour	Cane Position	Pubescent Cane	Overall selection score	Secondary Laterals	Notes
TULAMEEN	4.8	10.3	8	5	7	8	5-6	8	8		5		Fruit glossy & attractive, a bit soft, very sweet.PNW aftertaste, poor establishment last year - poor yield
00152F-2	3.6	11.1	5	5	5	4	4	4	7		4		Glossy, torn collar.
00154D-4	3.3	6.7	4	6	6	8	4	4	6		4	*	Glossy, small, nothing special
0039F-2	4.8	7.7	5	3	6	8	4	7	1	*	4		Still fruit on high laterals. Aromatic, acid & floral.Trailing habit - out of control since first pick
9046RA2	3.1	7.1	6	6	7	8	4	5	8		4		Small, dark,too soft, floral., no red spider infection
9451D4	4.9	10.2	4	5	8	7	7	4	6	*	4	*	Very juicy, little flavour from early fruit but improves later in season
9612E2	7.5	8.1	5	5	7	6	6	4	8		4		Round, meaty, slightly acid, little mildew, upright canes
9908A4			4-6	5	6	7	7	5			4		Beetle damage, uneven shape, sweet & pleasant
99105B-1	5	9.8	4	6	5	8	4	4	9		4	*	Drupes dry & separating, dull. Some mildew on u/r fruit, small leaves on primocane, short internodes, compact upright habit
99105RC-2	4.1	9.6	4	6	6	4	3	7	9		4		Very rough & large drupes, good flavour:Very poor quality.
99106D3	5.8	9.9	6	6	8	7	7	5	6		4		Large, meaty, sweet & juicy but little flavour, bright
GLEN MOY	4.7	7.6	5	4	6	7	4	7	8	*	4	*	Nice flavour, dull & blotchy, large late fruit on secondary laterals
GLEN ROSA	4.1	10.9	5	6	6	6	4	5	7	*	4	*	soft and juicy, typical Rosa flavour - too floral, v. blotchy fruit, some crumbly
0030E-12	4.0	9.5	6	6	5	6	4	5	5		3		Too soft, pleasant flavour early season but goes small and develops off flavours
9751E-2	4.6	9.4	5	5	8	7	6	4	4	*	3	*	Primocane fruit? Large, meaty awful, Terrible habit.
9451F2	2.9	9.4	5	6	7	6	5	3	7	**	3		Dry, dark, blotchy. No juice or flavour all season
0019F12	5.8	7	6	5	7	6	8	4	5	**	3	*	Blotchy, glossy uneven ripening., v. large, no flavour
0031B-2	4.6	8.9	5	3	6	5	4	3	5	*	3		Pale and glossy, big drupes, bland, bleeding - too soft, poor cane habit - lying out in row, some collapsed
0096RF-6	5	9.6	5	4	6	7	4	4	7	*	3	*	Looks like Moy, dull bloom, some aroma - not bad flavour, slightly acid, mildew, v. vigorous primocane

Selection	Mean Fruit Size (g)	Mean Brix %	Fruit shape	Fruit Colour	Pick	Collar	Firmness	Flavour	Cane Position	Pubescent Cane	Overall selection score	Secondary Laterals	Notes
9059D-2	5.3	9.4	6	4	7	6	4	5	8		3	*	Very rough & pale through season. Like Shee. Some flavour & sweet, not as good as grown outside, big heart-shaped leaves, susceptible to aphids
9601C-1	4.3	10.2	6	8	7	8	5	3	6		3		Too dark, earthy & metallic flavour, many splits in primocane
99105B7	4.5	8.5	5	7	5	7	6	4	7		3		Mildew, dull, purple, dry, acid, some red spider, collapsing primocane
99111B2	5.2	8	6	6	8	7	6	2	9		3	*	Meaty, acid & bitter - awful, acid, glossy, fruit stays large all season
9908B-1	6.5	7.4	6	8	6	7	6	3	7		2	*	V-dark, dull bloom, some mildew. Easy crumbled, bad red spider, purple, little flavour
99105RD-4	5	8.4	5	7	6	8	5	3	7		2		Drupes dry & separating, dull, mildew.
0082B5	4.6	8.4	5	8	7	6	3	2	6		1	*	Purple, dull, like Chiliwack. Too soft. Very floral & bitter, collar tears, bad cane spot and mildew, severe leaf spot infection in all reps
0019E3									7			*	
00100C6	3.9								4				
003A8	4								5	*			Aphids on primocane
9901B-3	4.4	10.4							8				
9908A2	5.5								7			*	Red spines.
EM6490/95									6	*			Caterpillar damage on primocane. Primocane below top wire.
NZ91319RJA7									8				

Table 9 On-farm trials fruiting in 2005

Grower	Address	Date Planted	Testing & Ret	No. of Plants				
				9062E-1	9053B6	9050RD3	9046RA2	9059D-2
John Hamilton	Milton Of Ruthven, Craigton, Blairgowrie, PH12 8RG	Spring 99	SSFG	1,000				
Peter Marshall	Muirton, Alyth, PH11 8JF	Spring 99	SSFG	6,300				
Peter Marshall	Muirton, Alyth, PH11 8JF	Spring 99	SSFG			6,300		
Peter Marshall	Muirton, Alyth, PH11 8JF	Autumn 2002	141		100	100		
Peter Marshall	Muirton, Alyth, PH11 8JF	Autumn 2002	184				225	
Peter Thomson	Bramblebank Works, Blairgowrie, PH10 7HY	Spring 2002	139		200	200		
Trevor Reynolds	Long Drove Waterbeach, Cambridge CB5 9LR	Autumn 2002	139		200	200		
EW Mitchell	Kinpurnie Farm, Newtyle, PH12 8SQ	Autumn 2002	184				225	
Richard Stanley	Rectory Farm, Stanton ST. John, Oxford OX33 1HF	Autumn 2002		60	60	60	60	60
Richard Stanley	Rectory Farm, Stanton ST. John, Oxford OX33 1HF	Spring 2003		30				
Ewan Pate	South Powrie, by Dundee	Spring 2002	142		300	300		
Robert Simpson	Tarvit Home Farm, Cupar KY15 5SU	Autumn 2002	155		120	120		
Rupert Hargreaves	Hargreaves Plants, Long Sutton, Spalding PE12 9GG	Autumn 2002	138		100	100		

Table 10 Fruit samples sent to Charis in 2005

Delivery to Charis	Date Picked	Selection	Cropping System	Location	
19 th July 2004	17 th July 2005	Glen Ample	Outside	HDC trial, Oxford	
		Tulameen	Outside	HDC trial, Oxford	
		9059D-2	Outside	HDC trial, Oxford	
		9062E-1	Outside	HDC trial, Oxford	
		9612F2	Outside	HDC trial, Oxford	
		9046RA2	Outside	HDC trial, Oxford	
		9053B6	Outside	HDC trial, Oxford	
		9455E3	Outside	HDC trial, Oxford	
		18 th July 2005	Glen Ample	Polytunnel	SCRI
				9455F-2	Polytunnel
00123A7	Polytunnel			SCRI	
004A1	Polytunnel			SCRI	
26 th July 2004	25 th July 2005	Glen Ample	Polytunnel	SCRI	
		Tulameen	Polytunnel	SCRI	
		9455F-2	Polytunnel	SCRI	
		00123A7	Polytunnel	SCRI	
		004A1	Polytunnel	SCRI	
		99111A1	Polytunnel	SCRI	
		99111B2	Polytunnel	SCRI	
		9053B6	Outside	Peter Marshall, Alyth	
2 nd August 2005	1 st August 2005	9053B6	Outside	SCRI	
		9764F-3	Outside	SCRI	
		9628E-3	Outside	SCRI	
		00123A7	Polytunnel	SCRI	
		9455F-2	Polytunnel	SCRI	
		99111A1	Polytunnel	SCRI	
		Glen Ample	Polytunnel	SCRI	
		Tulameen	Polytunnel	SCRI	
		Octavia	Polytunnel	Peter Thomson, Blairgowrie	
		9053B6	Outside	Peter Marshall, Alyth	
	9062E-1	Outside	Peter Marshall, Alyth		

Table 11 Distribution of on-farm selections in 2005

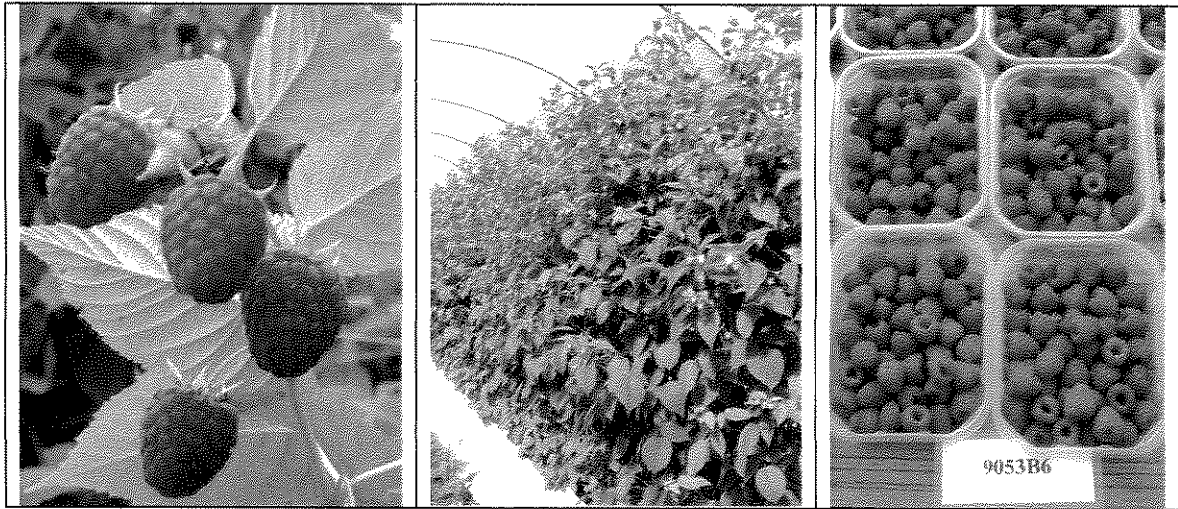
Customer	Triallist	Trialling & Testing	9059D-2	9612F2	99111B2	9455F-2	9451D4	9751E-2	99111A1	Delivery
Hargreaves	Jane Fairlie, Hargreaves Plants Ltd, Cowpers Gate, Long Sutton, PE12 9BS	243.05	25	25	25	25				June 2005
		250	39			12	50	50	50	Autumn 2005
KG	Peter Bevan, KG Fruits Ltd, Tatlingbury Oast, Five Oak Green, Tonbridge, Kent, TN12 6RG	244.05	15	15	15	15				June 2005
		251	47				50	50	50	Autumn 2005
Berryworld	Paul Harold, Sunclose Farm, Butt Lane, Milton, Cambridge, CB4 6DQ	245.05	20	20	20	20				June 2005
	Peter Vinson, E Vinson Ltd, Ewell Farm, Graveney Road, Faversham, Kent, ME13 8UP	246.05	20	20	20	20				June 2005
		255					20	20		Autumn 2005
	Harry Hall, Hall Hunter Partnership, Heathlands Farm, Honey Hill, Wokingham, Berks	252	34				30	30		Autumn 2005
Trade Solutions	Peter Marshall, Peter Marshall & Co, Muirton of Alyth, Alyth, PH11 8JF	247.05		12	110	25				June 2005
	Michael Thomson, Oakbank House, Blairgowrie, PH10 6TB	253	74				50	50	150	Autumn 2005
ASF	Lochy Porter, Angus Soft Fruit Ltd, East Seaton, Arbroath, DD11 5SD	254	76			38	50	50	50	Autumn 2005
Summerfruit Company	Charles Atkins, Amery Court Farm, Chapel Lane, Blean, Canterbury,	249	50			38	50	50		Autumn 2005

APPENDIX: 2

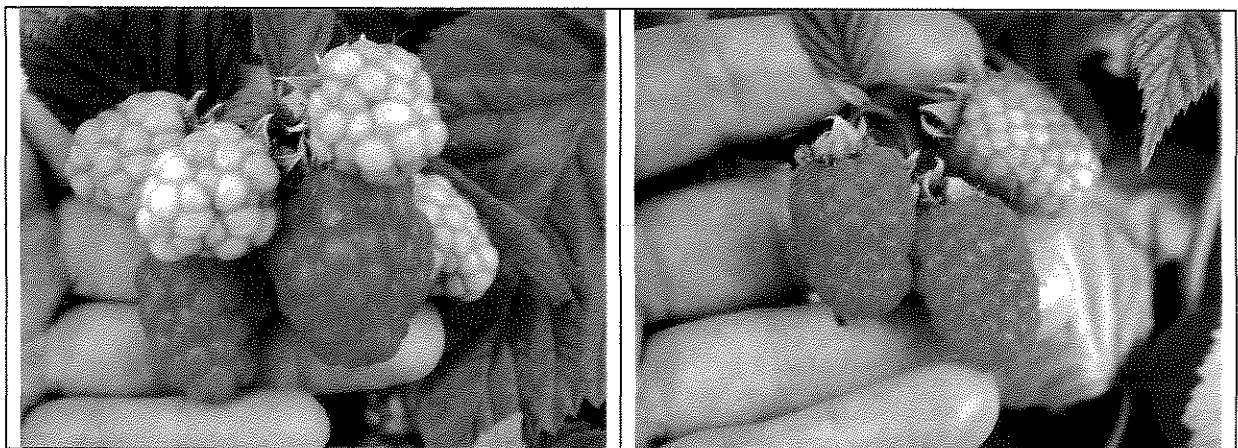
Photographs



SCRI selections under protected cropping system



Raspberry selection 9053B6 (provisional name Glen Doll)



Selection 9059D-2 (showing both crumbly fruit and good fruit set)



Selection 00123A7



Selection 9455F-2

APPENDIX: 3

Charis Report to SCRI, Sensory Evaluation of Fresh Raspberry – July 2005

APPENDIX: 4

**Charis Report to SCRI, Sensory Evaluation of Fresh Raspberry – 26
July 2005**

APPENDIX: 5

**Charis Report to SCRI, Sensory Evaluation of Fresh Raspberry – 2
August 2005**

APPENDIX: 6

Trial Results