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| **Project title:** | Summer Fruiting Raspberry Varieties Trial |
| **Project number:** | SF 041d |
| **Project leader:** | Janet Allen, ADAS |
| **Report:** | Annual Report, March 2016 |
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| **Location of project:** | Rectory Farm, Stanton St John, Oxford |
| **Industry Representative:** | Salih Hodzov, WB Chambers |
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## AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

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# GROWER SUMMARY

## Headline

- Four new summer fruiting raspberry varieties/selections show considerable promise for commercial production in the UK, including Squamish (very early), 0485K-1 (early-mid), EM6805/142 (late) and EM6804/81 (late).

## Background

There is a continuing requirement to identify summer fruiting raspberry varieties for commercial production which meet the evolving needs of the market, whilst offering opportunities for profitable production to growers. This project has been established within a commercial plantation of raspberries to identify varieties and advanced selections which offer:

- High yields and reliable cropping over the longest possible season
- Reduced labour costs through ease of cane management and improved fruit presentation for picking
- Fruit with an attractive appearance, good flavour, texture and shelf-life
- Potential to reduce reliance on traditional crop protection methods through improved tolerance or resistance to major pests and diseases

In combination, these traits will enable the UK industry to maintain and increase its market share, extend the harvest season and, importantly, reduce unit costs.

This trial has been designed to critically evaluate cultivars and advanced selections, sourced from UK and overseas raspberry breeding programmes. It aims to appraise cultivars that are now, or soon may be, available to growers for which there is little or no experience as to their suitability for growing in the UK or elsewhere in Europe. The trial includes two advanced selections from James Hutton Ltd. (0485K-1 and 0019E-2) and Jeanne d' Orleans from the Agricultural and Agri-Food Research Canada sub-station in L'Acadie, Quebec. These were identified as having considerable commercial potential in the previous AHDB Horticulture funded raspberry variety trial (SF 041c).

## Results of the Variety Trials

This is a summary of the information presented in the Full Trial Report. Please refer to the 'Full Trial Report' for full and comprehensive information on the results.

Tables 1 and 2 provide details of the varieties and numbered selections included in both the main replicated plots and those included in the single guard plots. All selections were planted in 2013 except those marked * which were planted in 2014.

**Table 1**. Details of the main entry selections in order of season, with their source and type of planting material used.

| Variety | Source, country | Planting material | Season | 2015 Harvest start date | 2015 Harvest end date |
|---|---|---|---|---|---|
| 0435D-3 | James Hutton Ltd., Scotland | Module plants | Very Early | 18/06/2015 | 03/08/2015 |
| BC 92-9-15 (Squamish) | PARC, Canada | Module plants | Early | 18/06/2015 | 29/07/2015 |
| 0485K-1 | James Hutton Ltd., Scotland | Module plants | Early-mid | 26/06/2015 | 03/08/2015 |
| Tulameen (Naktuinbouw clone) | RW Walpole, England | Module plants | Mid | 26/06/2015 | 12/08/2015 |
| AAC Eden (KO6-2) | PARC, Canada | Module plants | Mid | 18/06/2015 | 10/08/2015 |
| 0019 E2 | James Hutton Ltd., Scotland | Module plants | Mid-Late | 01/07/2015 | 12/08/2015 |
| Octavia | RW Walpole, England | Module plants | Late | 01/07/2015 | 12/08/2015 |
| EM6803/16 | EMR, England | Module plants | Late | 29/06/2015 | 10/08/2015 |
| EM6805/142 | EMR, England | Module plants | Late | 01/07/2015 | 12/08/2015 |
| EM6804/68 | EMR, England | Module plants | Late | 01/07/2015 | 03/08/2015 |
| 0447C-5 | James Hutton Ltd., Scotland | Module plants | Late | 26/06/2015 | 12/08/2015 |
| EM6804/81 | EMR, England | Module plants | Late - V Late | 29/06/2015 | 12/08/2015 |

**Table 2.** Details of the guard entry selections in order of season, with their source and type of planting material used.

| Variety | Source, country | Planting material | Season | 2015 Harvest start date | 2015 Harvest end date |
|---|---|---|---|---|---|
| 0658 C-5 | James Hutton Ltd., Scotland | Module plants | Early | 26/06/2015 | 10/08/2015 |
| 0550 E4 | James Hutton Ltd., Scotland | Module plants | Early | 29/06/2015 | 10/08/2015 |
| Glen Fyne | James Hutton Ltd., Scotland | Module plants | Early | 03/07/2015 | 05/08/2015 |
| 0460 F-5 | James Hutton Ltd., Scotland | Module plants | Early | 03/07/2015 | 05/08/2015 |
| RU004 03067* | Graminor Norway | Module plants | Early-Mid | - | - |
| RU044 03073* | Graminor Norway | Module plants | Early-Mid | - | - |
| WSU 1568 | WSU, America | Module plants | Early-Mid | 03/07/2015 | 29/07/2015 |
| BC 1- 88-6 | James Hutton Ltd., Scotland | Module plants | Early-Mid | 01/07/2015 | 03/08/2015 |
| RU004 04106* | Graminor Norway | Module plants | Early-Mid | - | - |
| WSU 1607 | WSU, America | Module plants | Early-Mid | 03/07/2015 | 05/08/2015 |
| WSU 1605 | WSU, America | Module plants | Mid | 03/07/2015 | 12/08/2015 |
| Tulameen Pearl Clone 299-5 | PARC, Canada | Module plants | Mid | 03/07/2015 | 10/08/2015 |
| Tulameen Pearl Clone 300-5 | PARC, Canada | Module plants | Mid | 29/06/2015 | 12/08/2015 |
| Tulameen Pearl Clone 301-5 | PARC, Canada | Module plants | Mid | 03/07/2015 | 10/08/2015 |
| 0658 E-1 | James Hutton Ltd., Scotland | Module plants | Mid | 26/06/2015 | 29/07/2015 |
| 0427 G-7* | James Hutton Ltd., Scotland | Module plants | Mid | - | - |
| EM6804/42 | EMR | Module plants | Mid - Late | 29/06/2015 | 05/08/2015 |
| 0534RB1 | James Hutton Ltd., Scotland | Module plants | Mid - Late | 26/06/2015 | 12/08/2015 |
| 0015F-1 | James Hutton Ltd., Scotland | Module plants | Late | 29/06/2015 | 29/07/2015 |
| Ukee | PARC | Module plants | Late | 01/07/2015 | 03/08/2015 |
| Jean d'Orléans | PARC (L'Acadie, Quebec) | Module plants | Late | 01/07/2015 | 03/08/2015 |

*Planted in 2014

***Trial design and establishment***

The trial is located at Rectory Farm, Oxford and located within an established commercial plantation of Tulameen (Naktuinbouw clone) which is south facing and protected with Spanish style multi-bay polythene tunnels. The soil is a free draining, light, loamy sand. Vegetatively propagated module raised plants were used at planting. The modules were planted into polythene mulched raised beds which are supplied with water and most nutrients via trickle irrigation. The distance between plants in the row was 0.45 m and a 1 metre gap was maintained between individual plots throughout the trial. Four replicate plots of each of the main entries were planted with 10 plants. Guard entries were single unreplicated 10 plant plots. The main entry plots were set up with two rows of plants per tunnel bay and the guard entries with three rows per bay.

All of the main and the majority of the guard entries were planted as planting material became available in June, July or August of 2013. The exceptions were four selections in the guard plots (0427G, RU004 03067, RU044 03073 and RU004 04106) and a single plot of the main entry EM6803/16, which were all planted in July 2014. For this East Malling selection in the main entries, this was done to check that the plants supplied and planted were true to type. As in 2013 all the additional planting material was supplied as module raised plants.

The plants supplied in 2013 established a large root system and, in the majority of cases, reasonable amounts of primocane growth during the year of planting. However, so as to ensure that all plants were as even in growth as possible and that their first harvest would be as fully cropping plants, all of the canes produced by them in 2013 were removed whilst they were fully dormant, by cutting out at ground level in mid-February 2014.

In late May, the first flush of primocane produced by these cut back plants was thinned by hand down to three to four per plant. This was repeated in early August 2014. A further thinning of the canes was made between September and early October 2014, so as to leave approximately three canes/plant or six floricane per linear run of crop row, to fruit in 2015. After this final thinning, the retained canes were secured (laced with twine) to the fixed wires of the crop support trellis. Canes were managed as per commercial practice on site throughout 2015 with, as in the previous growing season, unwanted primocane removed from the crop rows in May and June and finally immediately post-harvest.

Harvest in 2015 commenced on 19 June and was completed on 12 August. Assessments were made of yield, berry weight, fruit quality, shelf life, ease of picking, plant habit and plant pest and disease susceptibility.

***2015 results***

Fruit was picked and assessed three times a week throughout the harvest period. Within the main replicated trial, several of the selections achieved a marketable yield of more than 2 kg per plant, greater than either Tulameen or Octavia, the industry standards. All of the 2015 assessments are summarised in Tables 3-6.

**Table 3.** Summary of the yield and average berry weights of the main entries in 2015 in order of season – earliest selections first

| Variety/Selection | Marketable yield kg/plant | % marketable fruit | Average flori-cane /plant | Average berry weight over the season (g) | Minimum berry weight (g) | Maximum berry weight (g) |
|---|---|---|---|---|---|---|
| 0435D-3 | 2.2 | 86.1 | 2.8 | 3.8 | 2.6 | 5.8 |
| BC 92-9-15 (Squamish) | 2.0 | 89.5 | 2.9 | 4.0 | 2.6 | 5.6 |
| 0485K-1 | 1.4 | 93.5 | 2.7 | 4.7 | 2.6 | 6.5 |
| Tulameen (Naktuinbouw) clone) | 1.7 | 82.5 | 2.9 | 4.4 | 3.3 | 5.9 |
| AAC Eden (KO6-2) | 1.9 | 60.5 | 2.8 | 4.8 | 3.3 | 7.4 |
| 0019 E2 | 2.1 | 86.0 | 2.5 | 4.9 | 3.8 | 7.1 |
| Octavia | 1.6 | 81.4 | 2.2 | 5.0 | 3.1 | 7.8 |
| EM6803/16 | 1.9 | 35.9 | 1.8 | 4.7 | 3.4 | 6.4 |
| EM6805/142 | 2.0 | 89.1 | 2.3 | 5.1 | 3.8 | 7.2 |
| EM6804/68 | 1.3 | 74.8 | 2.5 | 4.4 | 3.2 | 6.5 |
| 0447C-5 | 2.1 | 92.0 | 3.0 | 5.4 | 3.9 | 7.6 |
| EM6804/81 | 2.1 | 90.3 | 2.5 | 4.8 | 3.6 | 6.6 |

**Table 4.** Summary of the yield and average berry weights of the guard entry plots in 2015 in order of season– earliest selections first

| Variety/Selection | Marketable yield kg/plant | % marketable fruit | Average flori-cane /plant | Average Berry Weight over the season (g) | Minimum berry weight (g) | Maximum berry weight (g) |
|---|---|---|---|---|---|---|
| 0658 C-5 | 2.8 | 82.1 | 3.0 | 4.7 | 3.4 | 6.0 |
| 0550 E4 | 1.6 | 82.4 | 2.2 | 3.7 | 2.4 | 5.6 |
| Glen Fyne | 1.0 | 59.8 | 2.8 | 3.5 | 2.6 | 5.0 |
| 0460 F-5 | 1.4 | 95.1 | 2.9 | 4.2 | 3.4 | 5.5 |
| WSU 1568 | 1.8 | 88.3 | 3.0 | 4.3 | 3.2 | 6.0 |
| BC 1-88-6 | 3.7 | 70.8 | 3.5 | 4.9 | 2.6 | 6.1 |
| WSU 1607 | 2.5 | 86.4 | 3.0 | 5.8 | 4.6 | 7.9 |
| WSU 1605 | 2.1 | 88.6 | 3.1 | 5.5 | 4.5 | 7.4 |
| Tulameen Pearl Clone 299-5 | 2.8 | 90.6 | 3.2 | 5.0 | 4.2 | 6.6 |
| Tulameen Pearl Clone 300-5 | 2.9 | 88.3 | 2.7 | 4.9 | 3.7 | 6.1 |
| Tulameen Pearl Clone 301-5 | 3.7 | 89.5 | 2.7 | 5.4 | 4.5 | 6.7 |
| 0658 E-1 | 2.7 | 74.7 | 2.6 | 4.8 | 3.4 | 7.0 |
| EM6804/42 | 2.0 | 80.2 | 3.0 | 4.1 | 3.4 | 5.4 |
| 0534RB1 | 2.4 | 83.7 | 3.3 | 5.2 | 4.2 | 6.5 |
| 0015F-1 | 0.8 | 77.3 | 1.9 | 3.5 | 2.6 | 4.4 |
| Ukee | 2.0 | 83.0 | 3.1 | 3.5 | 2.8 | 5.0 |
| Jean d'Orléans | 1.8 | 83.7 | 3.2 | 3.1 | 1.2 | 4.0 |

**Table 5.** Aggregated berry quality scores and BRIX° for the main selections in 2015 in order of season – earliest selections first

| Variety/Selection | Brix | Flavour | Aggregated quality score (/35)* |
|---|---|---|---|
| 0435D-3 | 6.9 | 3.1 | 23.9 |
| BC 92-9-15 (Squamish) | 10.5 | 4.2 | 26.2 |
| 0485K-1 | 10.0 | 3.9 | 26.3 |
| Tulameen (Naktuinbouw clone) | 9.5 | 4.4 | 26.1 |
| AAC Eden (KO6-2) | 9.0 | 4.0 | 24.6 |
| 0019 E2 | 6.9 | 3.3 | 26.1 |
| Octavia | 8.3 | 2.9 | 25.1 |
| EM6803/16 | 7.3 | 3.0 | 22.3 |
| EM6805/142 | 7.4 | 2.9 | 26.0 |
| EM6804/68 | 7.5 | 2.9 | 23.3 |
| 0447C-5 | 8.0 | 3.8 | 26.0 |
| EM6804/81 | 8.4 | 3.4 | 26.5 |

*The aggregated score includes redness, brightness, outline, texture, cohesiveness, skin strength and flavour – higher score = better berry

**Table 6.** Aggregated berry quality scores and BRIX° for the guard selections in 2015 in order of season – earliest selections first

| Variety/Selection | Brix | Flavour | Aggregated quality score (/35)* |
|---|---|---|---|
| 0658 C-5 | 8.6 | 3.7 | 27.0 |
| 0550 E4 | 9.4 | 4.0 | 26.0 |
| Glen Fyne | 8.6 | 4.0 | 26.8 |
| 0460 F-5 | 10.0 | 4.0 | 26.5 |
| WSU 1568 | 10.0 | 4.0 | 27.0 |
| BC1 88-6 | 9.4 | 3.6 | 25.9 |
| WSU 1607 | 8.2 | 3.5 | 27.5 |
| WSU 1605 | 9.8 | 4.0 | 27.7 |
| Tulameen Pearl Clone 299-5 | 10.7 | 4.5 | 26.0 |
| Tulameen Pearl Clone 300-5 | 10.8 | 4.5 | 26.0 |
| Tulameen Pearl Clone 301-5 | 9.7 | 4.5 | 26.8 |
| 0658 E-1 | 8.0 | 4.0 | 25.7 |
| EM6804/42 | 9.4 | 3.3 | 25.2 |
| 0534RB1 | 10.3 | 3.8 | 26.2 |
| 0015F-1 | 6.0 | 3.7 | 26.0 |
| Ukee | 8.2 | 3.8 | 26.5 |
| Jean d'Orléans | 9.8 | 4.2 | 25.7 |

*The aggregated score includes redness, brightness, outline, texture, cohesiveness, skin strength and flavour – higher score = better berry

Assessments of pest and disease susceptibility, plant habit, bud break and lateral development are detailed in the Full Trial Report (below) and individual descriptions of all selections can be found in the appendices. Further information along with images of the fruit on the plant and in punnets is available in a presentation on the AHDB Horticulture website at: http://horticulture.ahdb.org.uk/publication/presentation-raspberry-selections-ahdb-horticulture-raspberry-variety-trial.

## Main Conclusions

In 2015 the selections of particular interest from the main trial were:

- Squamish (BC 92-9-15)
- 0485K-1

### *Squamish*

Squamish was harvested exceptionally early and produced 2 kg/plant of fruit. The fruit was not very large but had an excellent flavour, was evenly set, bright and attractive in the punnet (Figure 1) and had a good shelf life. Other benefits of this selection are that it is reported to have tolerance to *phytophthora* root rot and in this trial its plant growth habit and lateral characteristics made it very easy and cheap to pick and grow. It attracted a lot of interest at the variety trial open day held on 20 July 2015.


**Figure 1.** Squamish (BC 92-9-15)

### *0485K-1*

The fruit was attractive and very uniform in size and shape (Figure 2). The selection had large, attractive, evenly set and cohesive berries so that a very high proportion of the fruit picked was marketable. Berry flavour was excellent and shelf life was also good. The fruit was well displayed to pickers on long laterals and was easy to pick. However, support for the fruiting laterals is recommended to avoid unacceptable lateral breakage during harvest. Recent research at the James Hutton Institute has shown that this selection has a high chilling requirement (in excess of that of Glen Ample). This finding was supported by the very poor bud break displayed by the

floricane of 0485K-1 in spring 2015. Fruit production was in the main confined to the top third section of floricane, with the majority of buds below this point failing to develop. As a consequence, the potential yield of this entry was not achieved in 2015.


**Figure 2.** 0485K-1

*Other varieties/selections of interest in 2015*

Other high yielding selections in 2015 included **0019E2** (James Hutton Ltd.) which produced high yields and large fruit but like 0485K-1, showed problems with poor bud break and lateral breakage in 2015. **EM6805/142** and **EM6804/81** (East Malling Research) produced a good yield and berries of both looked good in a punnet. However the flavour of all three of these entries was not as good as Squamish or 0485K-1.

Of the guard entries, three selections were outstanding. These included **BC 1-88-6** (PARC- Figure 3) which had a very high yield and very good quality berries and was the highest scored selection at the variety trial open day. **WSU 1607** (Figure 4), a mid to late selection from Washington State, had a very large average berry size of 5.8 g, a long harvest period, distinct fruit flavour and was very popular with growers who visited the open day, along with the two other WSU selections. **0534RBI** (James Hutton Ltd – Figure 5) was also rated highly by visitors to the trial. It had a wonderful flavour, is late harvested, has large sized fruit (average 5.1 g), produced a marketable yield of 2.4 kg/plant with 84% of the fruit harvested being marketable. The three Tulameen Pearl clones in the guard selections also performed very well.


**Figure 3.** PARC BC1-88-6


**Figure 4.** WSU 1607


**Figure 5.** JH Ltd 0534RBI

## Action points for growers

Growers should consider planting any of the following varieties in the future:

- Squamish (BC 92-9-15)
- 0485K-1
- 0019E2
- EM6805/142
- EM6804/81
- BC 1-88-6
- WSU 1607
- Tulameen Pearl Clones (299-5, 300-5 and 301-5)
- 0534 RB1

# Science Section

## Introduction

There is a continuous requirement to identify new raspberry varieties for commercial production which meet the ever changing needs of the market, whilst offering opportunities for profitable production to growers. This trial has been commissioned to identify new cultivars and advanced selections which will offer UK raspberry producers the following criteria:

- Higher yields than the current industry standards
- Superior fruit quality (size, uniformity of shape, colour, texture, flavour and a long shelf life)
- Present fruit well to pickers, on strongly attached laterals, which ideally do not require support, with fruit which is readily detached, making it easy and cheap to harvest
- Plants with adequate vigour and primocane production for growing in soil or in substrate, with a good upright cane habit, making them easy and cheap to grow
- Plants that will offer better tolerance to winter and spring cold injury
- Pest and disease tolerance or resistance

The aim of the project is to evaluate and identify varieties and advanced selections from UK and overseas breeding programmes which can be used by UK growers to either replace existing standard varieties or extend the harvest period beyond that already achieved.

## Varieties and numbered selections included

This trial is examining varieties and advanced selections sourced from two UK raspberry breeding programmes; East Malling Research (EMR) and the James Hutton Institute (JHI) and four non-UK raspberry breeding programmes; Agricultural and Agri-Food Research Canada, Agricultural Agri-Food Research Canada substation in L'Acadie (PARC), Washington State University (WSU) and Graminor AS in Norway. It will offer the opportunity to appraise varieties that will or may soon be available to growers for which there is little or no experience as to their suitability for growing in the UK or elsewhere in Europe. The trial also includes two advanced selections from JHI (0485K-1 and 0019E-2) and Jeanne d' Orleans from Agricultural

and Agri-Food Research Canada sub-station in L'Acadie, Quebec. These were identified as having considerable commercial potential in the previous AHDB Horticulture funded raspberry variety trial (SF 041c).

Tables 7 and 8 provide details of the varieties and numbered selections included in both the main replicated plots and those in the single guard plots within this trial.

**Table 7.** Details of the main entry varieties and selections included in the trial - listed in order of season

| Variety | Source, country | Planting material | Season | Planting date |
|---|---|---|---|---|
| 0435D-3 | James Hutton Ltd., Scotland | Module plants | Very Early | 18th June 2013 |
| BC92-9-15 | PARC, Canada | Module plants | Early | 17th June 2013 |
| 0485K-1 | James Hutton Ltd., Scotland | Module plants | Early-Mid | 17th June 2013 |
| Tulameen | PARC, Canada | Module plants | Mid | 17th June 2013 |
| AAC Eden (KO6-2) | PARC, Canada | Module plants | Mid | 17th and 21st June 2013 |
| 0019 E2 | James Hutton Ltd., Scotland | Module plants | Mid-Late | 18th June 2013 |
| Octavia | EMR, England | Module plants | Late | 17th June 2013 |
| EM6803/16 | EMR, England | Module plants | Late | 12th August 2013 |
| EM6805/142 | EMR, England | Module plants | Late | 12th August 2013 |
| EM6804/68 | EMR, England | Module plants | Late | 12th August 2013 |
| 0447C-5 | James Hutton Ltd., Scotland | Module plants | Late | 18th June 2013 |
| EM6804/81 | EMR, England | Module plants | Late - Very Late | 12th August 2013 |

**Table 8.** Details of the additional guard entry varieties and selections included in the trial – listed in order of season

| Variety | Source, country | Planting material | Season | Planting date |
|---|---|---|---|---|
| 0658 C-5 | James Hutton Ltd., Scotland | Module plants | Early | 18th June 2013 |
| 0550 E4 | James Hutton Ltd., Scotland | Module plants | Early | 18th June 2013 |
| Glen Fyne | James Hutton Ltd., Scotland | Module plants | Early | 18th June 2013 |
| 0460 F-5 | James Hutton Ltd., Scotland | Module plants | Early | 18th June 2013 |
| RU004 03067 | Graminor Norway | Module plants | Early-Mid | 2nd July 2014 |
| RU044 03073 | Graminor Norway | Module plants | Early-Mid | 2nd July 2014 |
| WSU 1568 | WSU, America | Module plants | Early-Mid | 2nd July 2013 |
| BC1 88-6 | James Hutton Ltd., Scotland | Module plants | Early-Mid | 18th June 2013 |
| RU004 04106 | Graminor Norway | Module plants | Early-Mid | 2nd July 2014 |
| WSU 1607 | WSU, America | Module plants | Early-Mid | 2nd July 2013 |
| WSU 1605 | WSU, America | Module plants | Mid | 2nd July 2013 |
| Tulameen Pearl Clone 299-5 | PARC, Canada | Module plants | Mid | 18th June 2013 |
| Tulameen Pearl Clone 300-5 | PARC, Canada | Module plants | Mid | 18th June 2013 |
| Tulameen Pearl Clone 301-5 | PARC, Canada | Module plants | Mid | 18th June 2013 |
| 0658 E-1 | James Hutton Ltd., Scotland | Module plants | Mid | 18th June 2013 |
| 0427 G-7 | James Hutton Ltd., Scotland | Module plants | Mid | 22nd June 2014 |
| EM6804/42 | EMR | Module plants | Mid - Late | 12th August 2013 |
| 0534RB1 | James Hutton Ltd., Scotland | Module plants | Mid - Late | 18th June 2013 |
| 0015F-1 | James Hutton Ltd., Scotland | Module plants | Late | 18th June 2013 |
| Ukee | PARC | Module plants | Late | 18th June 2013 |
| Jean d'Orléans | PARC (L'Acadie, Quebec) | Module plants | Late | 18th June 2013 |

JHI – James Hutton Institute, EMR – East Malling Research, WSU – Washington State university, PARC – Pacific Agri-Food Research Centre

## Trial site details

The trial is planted in a field soil at Rectory Farm, Stanton St John, Oxford, OX33 1HF. It is hosted by kind permission of Richard Stanley and managed by Paul Clarke.

## Production details

The trial is located within a commercial south facing plantation of summer fruiting raspberries (cv. Tulameen - Naktuinbouw clone). The soil is a free draining light loamy sand.

All of the main and the majority of the guard entries were planted as planting material became available in June, July or August of 2013. The exceptions were four selections in the guard plots (0427G, RU004 03067, RU044 03073 and RU004 04106) and a single plot of the main entry EM6803/16, which were all planted in July 2014. For this East Malling selection in the main entries, this was done to check that the plants supplied and planted were true to type. As in 2013 all the additional planting material was supplied as module raised plants and all the plants for this trial were supplied as virus indexed and/or PHPS certified module raised plants grown from root cuttings.

All the plants were supplied with trickle irrigation and fertigated from planting onwards, as per the commercial planting of raspberries surrounding the trial. No trellis was in position at the time of planting. This was installed in early spring of 2014, so that the primocane of all the entries could be supported.

The plants supplied in 2013 established a large root system and in the majority of cases, reasonable amounts of primocane growth during the year of planting. However, so as to ensure that all plants are as even in growth as possible and that their first harvest would be as fully cropping plants, all of the canes produced by the 2013 planted plants were cut through at ground level and removed from the plantation in early February 2014, whilst fully dormant. Primocane produced by the plants during the spring and summer of 2014 were thinned by hand in early May, June and in August so that by the late summer, 2.5 - 3 canes/plant or 5.5 - 6.6 floricane/m of crop row, were retained to crop in 2015.

To prevent them being damaged by the wind, the primocane was held securely together and upright by two pairs of mobile wires affixed to the crop support trellis at 1.5 and 1.8 m above the ground. In late September 2014, as soon as their rind had

sufficiently matured, the primocane was secured (laced using twine) onto the two fixed wires on the support trellis into their fruiting positions for 2015.

The primocane was managed in 2015 as per the previous growing season, so that by early June the majority of the primocane to crop in 2016 had been selected (2.5 - 3 canes/plant or 5.5 - 6.6 floricane/m of crop row). Primocane was separated from the developing floricane and guided upwards through the centre of the crop rows using the two mobile wires fitted to the support trellis which were moved down or upwards to suitable points on the trellis as the primocane increased in height. Soon after the onset of harvest, strings were also affixed to the posts of the support trellis and run along either side of the crop canopy at 1.5 - 1.8 m above the ground so as to pull any primocane with a spreading habit back against the floricane to prevent it from impeding harvest.

Immediately post-harvest all floricane was cut through at ground level and left in position to wilt for 4 - 5 days, prior to its removal from the crop rows. As per 2014 the primocane was supported by the mobile wires of the trellis, placed in suitable positions to keep it upright and to prevent its damage by the wind. When sufficiently mature, it was laced to the trellis in late September to its 2016 fruiting position.

Pest, disease, weed control and the nutrition of the trial since planting has been as per required for the trial plants and since spring 2015, dictated by the requirements of the commercial planting of raspberries that surrounds it. In spring and early summer 2015 high levels of potato and the large raspberry aphid were experienced on the trial plants, including those with the A10 gene, and despite several attempts to eradicate these pests, full control was not achieved until the end of the harvest.

## Trial design

The main part of the trial is set up as a randomised block design with 12 varieties which are replicated four times with 10 plants in each plot. The trial plan is detailed in **Appendix 1**. The guard entry plots consist of unreplicated 10 plant plots (depending on plant availability). The raspberries were planted 0.45 m apart into polythene mulched raised soil beds, with 2.4 m between the crop rows and a 1 m wide plant free gap between each plot.

The main (replicated) trial was planted so that it could be protected in the cropping years using two Spanish style multi-bay tunnels. Each tunnel contains two rows of

raspberries, with each row containing a replicate of each main entry and standard varieties.

The guard entries were planted in an adjacent three row tunnel with the same spacing as described above.

## Trial records and data collected

The 2015 season followed a relatively mild winter with temperatures near or a little above average, particularly in December when sunshine hours were greater than average in the south east. Spring was also sunnier than usual but temperatures were in line with the long term average. March and April were dry but May brought some cooler, wetter, more unsettled weather. Summer saw some exceptionally hot days in late June and early July. On the whole temperature was about average and more rain fell than normal. June was sunny and settled. July saw some cold nights and August was quite dull and wet. Temperature and rainfall data are displayed in **Appendix 3**. There were no extreme weather events which adversely affected the trial. However some selections including 0485K-1, 0019E2 and Octavia, did not break bud evenly, which is most likely to be a result of a lack of winter chilling. The polythene tunnel structures were clad on the April and the cladding removed post-harvest on 15 August 2015.

### *Harvest season*

Harvest commenced with the earliest selections on 18 June and concluded on 12 August. **Tables 9 and 10** detail the dates at which each selection started and finished picking along with an idea of the picking profile.

**Table 9**. 2015 harvest dates for the main selections – including start date, 25%, 50%, 75% and end date

| Variety/Selection | Start | 25% | 50% | 75% | End |
|---|---|---|---|---|---|
| 0435D-3 | 18-Jun | 10-Jul | 10-Jul | 17-Jul | 03-Aug |
| BC92-9-15 (Squamish) | 18-Jun | 06-Jul | 08-Jul | 13-Jul | 29-Jul |
| 0485K-1 | 26-Jun | 15-Jul | 13-Jul | 17-Jul | 03-Aug |
| Tulameen (Naktuinbouw clone) | 26-Jun | 13-Jul | 17-Jul | 24-Jul | 12-Aug |
| AAC Eden (KO6-2) | 18-Jun | 13-Jul | 17-Jul | 24-Jul | 10-Aug |

| Variety/Selection | Start | 25% | 50% | 75% | End |
|---|---|---|---|---|---|
| 0019 E2 | 01-Jul | 13-Jul | 17-Jul | 24-Jul | 12-Aug |
| Octavia | 01-Jul | 15-Jul | 24-Jul | 03-Aug | 12-Aug |
| EM6803/16 | 29-Jun | 15-Jul | 22-Jul | 27-Jul | 10-Aug |
| EM6805/142 | 01-Jul | 17-Jul | 24-Jul | 03-Aug | 12-Aug |
| EM6804/68 | 01-Jul | 13-Jul | 17-Jul | 24-Jul | 03-Aug |
| 0447C-5 (Glen Dee) | 26-Jun | 06-Jul | 24-Jul | 31-Jul | 12-Aug |
| EM6804/81 | 29-Jun | 15-Jul | 24-Jul | 03-Aug | 12-Aug |

**Table 10**. 2015 harvest dates for the guard selections – including start date, 25%, 50%, 75% and end date

| Variety | Start | 10% | 50% | 90% | End |
|---|---|---|---|---|---|
| 0658 C-5 | 26-Jun | 10-Jul | 17-Jul | 27-Jul | 10-Aug |
| 0550 E4 | 29-Jun | 15-Jul | 22-Jul | 29-Jul | 10-Aug |
| Glen Fyne | 03-Jul | 13-Jul | 17-Jul | 22-Jul | 05-Aug |
| 0460 F-5 | 03-Jul | 13-Jul | 17-Jul | 24-Jul | 05-Aug |
| WSU 1568 | 03-Jul | 08-Jul | 13-Jul | 17-Jul | 29-Jul |
| BC1 88-6 | 01-Jul | 06-Jul | 13-Jul | 17-Jul | 03-Aug |
| WSU 1607 | 03-Jul | 13-Jul | 17-Jul | 24-Jul | 05-Aug |
| WSU 1605 | 03-Jul | 13-Jul | 22-Jul | 27-Jul | 12-Aug |
| Tulameen Pearl Clone 299-5 | 03-Jul | 13-Jul | 17-Jul | 24-Jul | 10-Aug |
| Tulameen Pearl Clone 300-5 | 29-Jun | 10-Jul | 17-Jul | 24-Jul | 12-Aug |
| Tulameen Pearl Clone 301-5 | 03-Jul | 13-Jul | 17-Jul | 27-Jul | 10-Aug |
| 0658 E-1 | 26-Jun | 08-Jul | 13-Jul | 22-Jul | 29-Jul |
| EM6804/42 | 29-Jun | 10-Jul | 17-Jul | 27-Jul | 05-Aug |
| 0534RB1 | 26-Jun | 13-Jul | 17-Jul | 27-Jul | 12-Aug |

| Variety | Start | 10% | 50% | 90% | End |
|---|---|---|---|---|---|
| 0015F-1 | 29-Jun | 10-Jul | 15-Jul | 22-Jul | 29-Jul |
| Ukee | 01-Jul | 13-Jul | 17-Jul | 24-Jul | 03-Aug |
| Jean d'Orléans | 01-Jul | 13-Jul | 19-Jul | 24-Jul | 03-Aug |

***Yields***

Fruit was picked by farm staff to commercial grade. Yields were recorded three times per week between 18 June and 12 August 2015. Fruit was graded into marketable/unmarketable and berry weight was measured by recording the weight of 25 representative berries. **Tables 11 and 12** detail the results for the main replicated trial and the guard selections respectively. Statistical analysis was by analysis of variance (ANOVA).

Of the main entries, the very early fruiting James Hutton Ltd. selection 0435D-3 had the highest yield, which was significantly higher than that of Octavia and Tulameen. This was closely followed by the James Hutton Ltd. selections 0447C-5 (Glen Dee) and 0019-E2 and the EMR selection EM6804/81 which all produced over 2 kg/plant. The lowest yielding selections were EM8804/68 (EMR) and 0485K-1 (James Hutton Ltd.) although the latter had 93% marketable fruit on average, significantly better than Octavia and Tulameen, suggesting high quality fruit and a fast picking potential. The main cause of the low yield of 0485K-1 was lack of bud break, with crop production confined for the majority of the plants to the top third of their floricane. EM6805/142 (EMR) and the PARC selection BC 92-9-15 (Squamish) also showed a very high percent marketable fruit. A high proportion of the EM6803/16 (EMR) plants produced primocane which had excessive side branches and irregular growth. In 2015 the canes of this entry produced a large amount of crumbly, poor flavoured, irregular fruit, inconsistent with previous observations of the performance and growth of this EMR selection. An additional guard plot of this selection was planted as a comparison in 2014 and is also showing the same traits. Having discussed this with EMR it was agreed that this must be an unstable selection and it will be removed from the trial.

Average berry weight ranged between 3.8 and 5.4 g. 0447C-5 (Glen Dee) on average had the largest berries and 0435D-3 had the smallest. Berry weight varied quite a bit over the season with several of the selections achieving berry weights of

over 7 g at their peak, such as Octavia and 0447C-5 (Glen Dee). Tulameen (Naktuinbouw clone) showed the smallest difference between the minimum and maximum berry weights, suggesting the most uniform fruit over the season, with Octavia and AAC Eden having the largest difference (over 4 g) in berry size across their respective harvest periods.

**Table 11**. Average yield and berry weights for the main replicated entries in 2015 – listed in order of season

| Variety/ Selection | Marketable yield (kg/plant) | Waste (g/plant) | % Marketable yield | Average berry weight (g) | Min. berry weight (g) | Max. berry weight (g) |
|---|---|---|---|---|---|---|
| 0435D-3 | 2.2 | 347.9 | 86.1 | 3.8 | 2.6 | 5.8 |
| BC 92-9-15 (Squamish) | 2.0 | 238.6 | 89.5 | 4.0 | 2.6 | 5.6 |
| 0485K-1 | 1.4 | 95.6 | 93.5 | 4.7 | 2.6 | 6.5 |
| Tulameen (Naktuinbouw clone) | 1.7 | 365.8 | 82.5 | 4.4 | 3.3 | 5.9 |
| AAC Eden | 1.9 | 1252.6 | 60.5 | 4.8 | 3.3 | 7.4 |
| 0019 E2 | 2.1 | 343.2 | 86.0 | 4.9 | 3.8 | 7.1 |
| Octavia | 1.6 | 380.3 | 81.4 | 5.0 | 3.1 | 7.8 |
| EM6803/16* | 1.9 | 3664.7 | 35.9 | 4.7 | 3.4 | 6.4 |
| EM6805/142 | 2.0 | 245.4 | 89.1 | 5.1 | 3.8 | 7.2 |
| EM6804/68 | 1.3 | 430.1 | 74.8 | 4.4 | 3.2 | 6.5 |
| 0447C-5 (Glen Dee) | 2.1 | 188.2 | 92.0 | 5.4 | 3.9 | 7.6 |
| EM6804/81 | 2.1 | 220.9 | 90.3 | 4.8 | 3.6 | 6.6 |
| **P. Value** | **0.036** | **<0.001** | **<0.001** | **<0.001** | **<0.001** | **<0.001** |
| **LSD (30df)** | **0.5629** | **319.8** | **9.535** | **0.4199** | **0.4671** | **0.7637** |

*EM6803/16 omitted from ANOVA due to inconsistency in planting material

Within the single plot guard trial, there were some very large yields with BC1-88-6, WSU1568, 0658 C-5 and the Tulameen Pearl clones yielding in excess of 2.8 kg/plant, with berry weights nearing 5 g or above on average. Some of these results do need to be treated with caution as the plots were unreplicated and some contained fewer than 10 plants, which may have allowed greater yield by the substantial reduction of plant to plant competition for light, nutrients and water compared to plots containing a full complement of plants. However, these data highlight the significant potential of these selections. 0460 F-5, the WSU selections and the Tulameen Pearl clones showed the highest percent marketable fruit and WSU 1607 and WSU 1605 had exceptionally large conic berries.

**Table 12**. Yield and berry weights for the unreplicated guard entries in 2015 – listed in order of season

| Variety/ Selection | Marketable yield (kg/plant) | Waste (g/plant) | % Marketable yield | Average berry weight (g) | Min. berry weight (g) | Max. berry weight (g) |
|---|---|---|---|---|---|---|
| 0658 C-5 | 2.8 | 605.5 | 82.1 | 4.7 | 3.4 | 6.0 |
| 0550 E4 | 1.6 | 337.0 | 82.4 | 3.7 | 2.4 | 5.6 |
| Glen Fyne | 1.0 | 701.2 | 59.8 | 3.5 | 2.6 | 5.0 |
| 0460 F-5 | 1.4 | 71.6 | 95.1 | 4.2 | 3.4 | 5.5 |
| WSU 1568 | 1.8 | 232.8 | 88.3 | 4.3 | 3.2 | 6.0 |
| BC1 88-6 | 3.7 | 1512.0 | 70.8 | 4.9 | 2.6 | 6.1 |
| WSU 1607 | 2.5 | 389.2 | 86.4 | 5.8 | 4.6 | 7.9 |
| WSU 1605 | 2.1 | 265.4 | 88.6 | 5.5 | 4.5 | 7.4 |
| Tulameen Pearl Clone 299-5 | 2.8 | 286.0 | 90.6 | 5.0 | 4.2 | 6.6 |
| Tulameen Pearl Clone 300-5 | 2.9 | 389.3 | 88.3 | 4.9 | 3.7 | 6.1 |
| Tulameen Pearl Clone 301-5 | 3.7 | 433.3 | 89.5 | 5.4 | 4.5 | 6.7 |
| 0658 E-1 | 2.7 | 917.1 | 74.7 | 4.8 | 3.4 | 7.0 |
| EM6804/42 | 2.0 | 487.8 | 80.2 | 4.1 | 3.4 | 5.4 |
| 0534RB1 | 2.4 | 469.4 | 83.7 | 5.2 | 4.2 | 6.5 |
| 0015F-1 | 0.8 | 221.1 | 77.3 | 3.5 | 2.6 | 4.4 |
| Ukee | 2.0 | 412.6 | 83.0 | 3.5 | 2.8 | 5.0 |
| Jean d'Orléans | 1.8 | 341.4 | 83.7 | 3.1 | 1.2 | 4.0 |

***Berry quality***

Once a week throughout harvest, marketable fruits from every plot were examined and fruit quality appraised on a 1 - 5 scale for seven quality parameters including; colour (i.e. redness also brightness), their outline, texture, skin strength, berry cohesiveness and flavour details. The results for the main entries are shown in **Table 13** and for the guard entries in **Table 14**. Brix° (sugar content) was also measured weekly using a refractometer.

Average Brix° over the season was highest in BC 92-9-15 (Squamish) and 0485K-1, closely followed by Tulameen (Naktuinbouw clone) and AAC Eden. 0435D-3 and 0019 E2 had the lowest Brix° readings. The selections with the higher Brix scores tended to score more highly on flavour. As discussed previously, EM6803/16 was the only selection which produced poor quality fruit. All the other selections produced fruit of adequate colour, shape, texture and cohesiveness. Of particular note were BC 92-9-15 (Squamish), 0485K-1 and EM6804/81 which scored highest when all the berry quality parameters were aggregated.

Of the guard entries, most berries showed a nice bright red colour and Brix° above 8, with the Tulameen Pearl clones, 0534RB1, WSU 1568, WSU 1605 and 0460 F-5 all showing an average Brix° of around 10. The best flavoured fruit was produced by the Tulameen Pearl clones and Jean d' Orleans. However in 2015 the fruit of none of the entries exhibited unpleasant or off flavours, all scoring equal to or above Octavia.

**Table 13.** Average berry quality scores and Brix° readings over the harvest period for the main replicated selections - listed in order of season

| Variety/ Selection | Brix° | *5=pale 1=dark* Redness | *5=bright 1=dull* Bright-ness | *5=even 1=irreg.* Outline | *5=firm 1=soft* Texture | *5=strong 1=weak* Skin strength | *5=whole 1=crumbly* Berry cohes'nes | *5= good 1= poor* Flavour |
|---|---|---|---|---|---|---|---|---|
| 0435D-3 | 6.9 | 3.1 | 3.8 | 3.7 | 2.9 | 3.4 | 3.9 | 3.1 |
| BC 92-9-15 (Squamish) | 10.5 | 3.1 | 4.0 | 3.6 | 3.5 | 3.9 | 4.0 | 4.2 |
| 0485K-1 | 10.0 | 2.7 | 4.1 | 4.2 | 3.4 | 4.0 | 4.1 | 3.9 |
| Tulameen (Naktuinbouw clone) | 9.5 | 2.7 | 4.3 | 4.0 | 3.0 | 3.8 | 3.9 | 4.4 |
| AAC Eden | 9.0 | 2.7 | 3.8 | 3.7 | 3.1 | 3.7 | 3.7 | 4.0 |
| 0019 E2 | 6.9 | 2.9 | 4.1 | 3.9 | 3.7 | 4.1 | 4.1 | 3.3 |
| Octavia | 8.3 | 3.8 | 3.6 | 3.4 | 3.5 | 4.0 | 4.0 | 2.9 |
| EM6803/16 | 7.3 | 3.5 | 4.3 | 2.7 | 2.5 | 3.4 | 3.0 | 3.0 |
| EM6805/142 | 7.4 | 3.9 | 4.0 | 3.9 | 3.4 | 4.0 | 4.0 | 2.9 |
| EM6804/68 | 7.5 | 2.4 | 3.5 | 3.7 | 3.2 | 3.8 | 3.8 | 2.9 |
| 0447C-5 (Glen Dee) | 8.0 | 3.2 | 3.9 | 3.8 | 3.4 | 3.9 | 4.0 | 3.8 |
| EM6804/81 | 8.4 | 2.8 | 4.2 | 4.2 | 3.7 | 4.0 | 4.2 | 3.4 |

**Table 14.** Average berry quality scores and Brix° readings over the harvest period for the unreplicated guard selections – listed in order of season

| Variety/ Selection | Brix° | *5=pale 1=dark* Redness | *5=bright 1=dull* Bright-ness | *5=even 1=irreg.* Outline | *5=firm 1=soft* Texture | *5=strong 1=weak* Skin strength | *5=whole 1=crumbly* Berry cohes'nes | *5= good 1= poor* Flavour |
|---|---|---|---|---|---|---|---|---|
| 0658 C-5 | 8.6 | 3.8 | 4.0 | 3.5 | 3.8 | 4.0 | 4.2 | 3.7 |
| 0550 E4 | 9.4 | 2.6 | 4.0 | 3.4 | 4.0 | 4.0 | 4.0 | 4.0 |
| Glen Fyne | 8.6 | 2.8 | 4.0 | 4.0 | 3.8 | 4.3 | 4.0 | 4.0 |
| 0460 F-5 | 10.0 | 2.0 | 4.0 | 4.0 | 4.0 | 4.3 | 4.3 | 4.0 |
| WSU 1568 | 10.0 | 3.0 | 5.0 | 4.0 | 3.3 | 3.7 | 4.0 | 4.0 |
| BC1 88-6 | 9.4 | 2.6 | 4.3 | 3.4 | 3.8 | 4.2 | 4.0 | 3.6 |
| WSU 1607 | 8.2 | 2.8 | 5.0 | 4.0 | 3.5 | 4.3 | 4.5 | 3.5 |
| WSU 1605 | 9.8 | 2.6 | 4.5 | 4.2 | 3.4 | 4.0 | 5.0 | 4.0 |
| Tul. Pearl Clone 299-5 | 10.7 | 2.8 | 4.0 | 3.8 | 3.0 | 3.8 | 4.3 | 4.5 |
| Tul. Pearl Clone 300-5 | 10.8 | 2.8 | 4.3 | 3.3 | 3.7 | 3.7 | 3.7 | 4.5 |
| Tul. Pearl Clone 301-5 | 9.7 | 2.5 | 4.5 | 4.3 | 3.3 | 3.5 | 4.3 | 4.5 |
| 0658 E-1 | 8.0 | 3.5 | 3.7 | 3.8 | 3.0 | 3.8 | 4.0 | 4.0 |
| EM6804/42 | 9.4 | 3.0 | 3.7 | 3.8 | 3.8 | 3.8 | 4.0 | 3.3 |
| 0534RB1 | 10.3 | 2.7 | 3.3 | 4.0 | 3.8 | 4.2 | 4.3 | 3.8 |
| 0015F-1 | 6.0 | 3.0 | 4.0 | 3.7 | 3.7 | 4.0 | 4.0 | 3.7 |
| Ukee | 8.2 | 4.0 | 3.5 | 4.0 | 3.0 | 4.0 | 4.3 | 3.8 |
| Jean d'Orléans | 9.8 | 2.0 | 3.7 | 3.8 | 3.6 | 4.0 | 4.4 | 4.2 |

When sufficient fruit was available, a punnet of marketable fruit harvested from each plot was placed in cold store at 3 - 4ºC for 48 hours. The fruit was then withdrawn from store and allowed to warm to the ambient temperature before assessment. Shelf life was analysed on six occasions. **Tables 15 and 16** show the average scores attained by the entries during the 2015 harvest. No rotten berries were observed after 48 hours in any variety and shelf life was consistently good. Of the main entry varieties, 0019 E2, 0447C-5 (Glen Dee) and EM6804/81 held their texture most strongly and, along with BC 92-9-15 (Squamish) and EM6805/142, maintained brightest berry appearance. EM6803/16 gave the poorest scores.

In the guard entries, again no varieties showed any rots after cold storage. 0658 C-5, EM6804/42 and WSU 1607 were firmest after 48 hours and, along with WSU 1568, the Tulameen Pearl Clones, 0534RB1 and Jean d'Orléans, had best overall appearance.

**Table 15.** Average shelf life scores over the harvest period for the main replicated selections – listed in order of season

| Variety/Selection | 5 = no rots<br>1= > 5 rots<br>Rotten berries | 5 = firm<br>1 = v. soft<br>Texture | 5 = bright<br>1 = v. dull<br>Appearance |
|---|---|---|---|
| 0435D-3 | 5 | 3.2 | 3.3 |
| BC 92-9-15 (Squamish) | 5 | 3.6 | 4.1 |
| 0485K-1 | 5 | 4.0 | 3.9 |
| Tulameen (Naktuinbouw clone) | 5 | 3.6 | 3.9 |
| AAC Eden (KO6-2) | 5 | 3.4 | 3.5 |
| 0019 E2 | 5 | 4.2 | 4.3 |
| Octavia | 5 | 3.8 | 4.0 |
| EM6803/16 | 5 | 3.0 | 3.1 |
| EM6805/142 | 5 | 4.1 | 4.1 |
| EM6804/68 | 5 | 3.9 | 4.0 |
| 0447C-5 (Glen Dee) | 5 | 4.3 | 4.1 |
| EM6804/81 | 5 | 4.4 | 4.3 |

**Table 16.** Average shelf life scores over the harvest period for the unreplicated guard selections – listed in order of season

| Variety/Selection | 5 = no rots<br>1= > 5 rots<br>Rotten berries | 5 = firm<br>1 = v. soft<br>Texture | 5 = bright<br>1 = v. dull<br>Appearance |
|---|---|---|---|
| 0658 C-5 | 5 | 4.4 | 4.6 |
| 0550 E4 | 5 | 4.0 | 4.0 |
| Glen Fyne | 5 | 4.0 | 4.0 |
| 0460 F-5 | 5 | 4.3 | 4.0 |
| WSU 1568 | 5 | 4.0 | 4.3 |
| BC1 88-6 | 5 | 4.3 | 4.0 |
| WSU 1607 | 5 | 4.5 | 4.5 |
| WSU 1605 | 5 | 3.5 | 3.8 |
| Tulameen Pearl Clone 299-5 | 5 | 4.3 | 4.5 |
| Tulameen Pearl Clone 300-5 | 5 | 4.2 | 4.2 |
| Tulameen Pearl Clone 301-5 | 5 | 3.3 | 4.0 |
| 0658 E-1 | 5 | 3.8 | 3.8 |
| EM6804/42 | 5 | 4.4 | 4.4 |
| 0534RB1 | 5 | 4.2 | 4.2 |
| 0015F-1 | 5 | 4.3 | 4.0 |
| Ukee | 5 | 3.0 | 3.3 |
| Jean d'Orléans | 5 | 4.3 | 4.3 |

Visitors to the AHDB variety trial open day for this trial on 22 July 2015, were asked to score the fruit for brightness, texture, colour and flavour and to state whether they felt the fruit had commercial potential or not. Data are presented in **Table 17 and 18.** BC92-9-15, (Squamish) and EM6805/142 were most popular for flavour. Of the guard entries, BC 1-88-6, Tulameen Pearl Clones, 0534RB1, WSU 1568 and WSU 1605 were also very popular. This data does however need treating with caution as

the harvest of the earliest selections (e.g. 0435D-3) was nearly completed by this date so their fruits were not at their best.

**Table 17.** Average quality scores given by visitors at the 2015 trial open day for the main replicated selections - listed in order of season

| Variety/ Selection | Has it commercial potential? (>values greater potential) | Brightness 5=bright 1=dull | Texture 5=firm 1=soft | Colour 5=pale 1=dark | Flavour 5=good 1=poor |
|---|---|---|---|---|---|
| 0435D-3 | 2.0 | 2.8 | 2.1 | 2.5 | 2.1 |
| BC 92-9-15 (Squamish) | 8.0 | 3.6 | 3.3 | 2.8 | 3.5 |
| 0485K-1 | 3.0 | 3.5 | 3.2 | 3.0 | 2.8 |
| Tulameen (Naktuinbouw clone) | 4.0 | 3.6 | 2.6 | 2.6 | 3.4 |
| AAC Eden (KO6-2) | 4.0 | 2.8 | 2.9 | 2.7 | 2.9 |
| 0019 E2 | 5.0 | 2.9 | 3.4 | 2.9 | 2.7 |
| Octavia | 5.0 | 2.9 | 3.1 | 2.0 | 2.9 |
| EM6803/16 | 3.0 | 3.6 | 2.6 | 3.3 | 2.4 |
| EM6805/142 | 5.0 | 3.0 | 3.1 | 3.3 | 3.4 |
| EM6804/68 | 5.0 | 2.6 | 2.6 | 2.6 | 3.0 |
| 0447C-5 (Glen Dee) | 4.0 | 3.7 | 3.4 | 3.0 | 2.8 |
| EM6804/81 | 6.0 | 3.1 | 3.8 | 2.3 | 3.0 |

**Table 18.** Average quality scores given by visitors at the 2015 trial open day for the unreplicated guard selections - listed in order of season

| Variety/ Selection | Has it commercial potential? (>values greater potential) | Brightness 5=bright 1=dull | Texture 5=firm 1=soft | Colour 5=pale 1=dark | Flavour 5=good 1=poor |
|---|---|---|---|---|---|
| 0658 C-5 | 2 | 2.7 | 3.3 | 3.3 | 2.4 |
| 0550 E4 | 1 | 2.5 | 3.7 | 2.3 | 2.3 |
| Glen Fyne | 3 | 3.4 | 2.8 | 3.3 | 3.0 |
| 0460 F-5 | 2 | 2.8 | 2.4 | 2.5 | 2.8 |
| WSU 1568 | 2 | 3.9 | 2.4 | 3.1 | 2.9 |
| BC1 88-6 | 4 | 3.8 | 4.5 | 3.9 | 3.4 |
| WSU 1607 | 4 | 4.0 | 3.3 | 3.0 | 2.6 |
| WSU 1605 | 4 | 3.5 | 3.1 | 3.8 | 2.9 |
| Tul.Pearl Clone 299-5 | 3 | 3.7 | 3.1 | 3.6 | 3.3 |
| Tul. Pearl Clone 300-5 | 4 | 3.0 | 2.5 | 2.4 | 2.4 |
| Tul. Pearl Clone 301-5 | 5 | 3.6 | 3.0 | 2.8 | 3.4 |
| 0658 E-1 | 3 | 3.4 | 2.7 | 3.3 | 2.5 |
| EM6804/42 | 3 | 2.7 | 2.9 | 2.0 | 3.1 |
| 0534RB1 | 3 | 3.2 | 3.0 | 2.8 | 3.5 |
| 0015F-1 | 2 | 2.3 | 3.4 | 3.0 | 2.0 |
| Ukee | 2 | 1.6 | 1.6 | 3.8 | 1.9 |
| Jean d'Orléans | 2 | 2.6 | 3.4 | 2.4 | 2.8 |

### *Plant architecture and pest/disease susceptibility*

Full descriptions of cane habit, management recommendations and pest and disease susceptibilities are shown in **Appendix 2**. No clear differences in susceptibility to the pest and disease profile on site was observed in 2015. Both large raspberry aphid and potato aphid were present in high numbers throughout the spring and early summer and had to be controlled with several applications of crop protection products.

## Discussion

The trial has identified several varieties and selections from the main and guard entries which are of interest to raspberry growers. These are discussed below. Full descriptions of all main and guard entries are provided in **Appendices 1** and **2**. All the plots will be harvested again in 2016 to confirm the potential of these and potentially other selections.

### *Main entries of particular interest*

*Squamish*

BC92-9-15 (Squamish) is a very early selection, one of the first to start in 2015 (18 June). It has a moderately sized berry averaging about 4 - 5 g which is a glossy, medium to darkening red colour (Figure 6), conical in shape, reasonably firm with large drupelets and a good aromatic flavour. The fruit has a good shelf life.

Laterals were produced along the full length of canes and were found to be short at the top and long at base. These were strongly attached, did not bow over and presented the fruit well to pickers, meaning lateral support should not be required. Canes are produced in adequate but not excessive numbers and are medium to tall with an upright to slightly spreading habit. The primocane is very easy to manage and their habit means that they do not impede picking. Squamish does have spines but these are most prominent at base. Little is known about its pest susceptibility but in Canada it is reported as having good field resistance to *phytophthora* root rot.


**Figure 6.** BC 92-9-15 (Squamish)

**0485K-1**

0485K-1 is an early to mid-season selection, producing large, conical fruit at the peak of its season, but size does decrease as the season progresses. Fruits are very glossy and very attractive in punnet (Figure 7), but they do darken slightly as they ripen. Canes are capable of producing high yields but in 2015 bud break was isolated to the top third of the floricane and as a consequence its yield suffered substantially. A very high proportion of the fruit harvested from 0485K-1 was class 1, which also had a good flavour and shelf life. Canes are tall and vigorous, spine free with an upright to spreading habit. The fruiting laterals are long and can break during harvest so lateral support would be essential for this selection.

0485K-1 has A10 aphid resistance and gene H tolerance to cane botrytis and spur blight. However, as was seen in SF41d, it is very susceptible to raspberry root rot.


**Figure 7.** 0485K-1

**EM6804/81**

EM6804/81 has a late season and continued picking until 12 August in 2015. Fruits were round and pale but bright, averaging around 5 g in size (Figure 8). They were firm and attractive with an excellent shelf-life, but only a moderate flavour. The primocane has a moderate vigour and is late emerging so does not interfere with harvest. Its fruiting laterals are long to very long. Although most are ascending in habit at first, they do bow over with the weight of fruit upon them late, tending to break and roll over; lateral support is therefore required. The fruit is easily removed from the laterals. The primocane is very upright in habit, vigorous and spiny, but most spines are not very prominent.


**Figure 8.** EM6804/81

**EM6805/142**

EM6805/142 was also late fruiting. Its berries were slightly larger (Figure 9), paler (colour similar to that of Octavia) and had a superior shelf life to EM6804/81 but its flavour was not quite as good. The fruiting laterals of EM6805/142 were ascending in habit and more strongly attached than those of EM6804/81, but to aid their picking, support would be beneficial.


**Figure 9.** EM6805/142

***Guard entries of particular interest***

**BC 1-88-6**

BC 1-88-6 is an early to mid-season selection, very high yielding in 2015 with long, neat, attractive, conical, bright berries (Figure 10) with small drupelets averaging 5 g. Berries are cohesive, mid red with a good flavour and shelf life. BC 1-88-6 has tall spiny canes with an upright to spreading habit and a large number of primocane can be produced. Laterals are long but the fruit is easy to find and detach. However lateral support would be useful for protected crops of this selection.


**Figure 10.** BC1-88-6

**WSU 1607**

WSU 1607 has a mid to late season, producing a large yield and large berries (6 g). Fruit is long and conical, glossy and very firm with a good flavour (which was quite distinct as having a hint of mulberry) and an excellent shelf life. Its fruiting laterals were very long and roll over with the weight of fruit so requires lateral support. The

fruit, however, is easily detached from the laterals. Canes are tall, upright and stout, primocane production is adequate and never excessive and the canes have spines.


**Figure 11.** WSU 1607

**WSU1605 and WSU1607**

Two further selections from Washington State University also performed well. WSU1605 was very similar to WSU1607, although berries were slightly smaller and less bright (Figure 12) but flavour was good and canes yielded 2.1 kg/plant. WSU 1568 (Figure 13) was slightly earlier with even larger, very sweet and very firm berries which almost looked unreal in the punnet. Its plant habit is similar but its yield slightly lower than WSU1607 or 1605. All three of the selections from Washington State University were highlighted by visitors to the open day as looking very impressive and having commercial potential.


**Figure 12.** WSU 1605


**Figure 13.** WSU 1568

**0534RB1**

0534RB1 is a mid to late selection from James Hutton Ltd. It produced a high yield (2.4 kg/plant) of very large conical fruit averaging over 5 g. Fruit was reasonably bright (Figure 14) with a very good sweet flavour and good shelf life. Canes produced laterals along their full length, which were medium to long at the top and middle and very long laterals at the base. The fruiting laterals tended to bow over a bit with fruit weight, but were strongly attached and the fruit was easy to pick so lateral support may not be required. This selection produced tall stout, spine free canes, with an upright to spreading habit and moderate vigour. It was easy to manage and cheap to pick. This selection has A10 aphid resistance.


**Figure 14.** 0534RB1

## Conclusions

The selections of particular interest from the main trial are: Squamish (BC 92-9-15), and 0485K-1.

**Squamish** was exceptionally early in 2015 and produced 2kg/plant. Unfortunately fruit was not that large but the berries had an excellent flavour which had a Brix superior to Tulameen. The berries looked bright and attractive in the punnet and showed a good shelf life. Another benefit of this selection is that it has root rot tolerance and its plant growth and lateral characteristics make it very cheap to pick and grow. A lot of interest in this variety was shown by the visitors to the AHDB Summer fruiting raspberry variety trial walk held at the trial on 22 July 2015. By that date its entry was nearing the end of its harvest and its fruit size was small, so it was far from being at its best. However it still achieved a substantial score and was considered to have commercial potential with many of the attendees asking if they could appraise it on their own farms and if plant material would be available to plant in winter 2015/16 or spring/early summer 2016.

**0485K-1** is a James Hutton Ltd. selection which also gained a lot of interest at the open day. The fruit is attractive and very uniform in size and shape. The selection produces a high proportion of marketable fruit, has excellent flavour, good shelf life and is easy to pick. However, as has been noted previously, this selection does require substantial winter chilling, which may not be reliably achieved for plantings outdoors during an average winter in the south of England. However, because of this entry's superb fruit qualities (including size, flavour and high potential class I), if sufficient chilling could be supplied to provide bud break down the majority of the length of floricane to substantially increase yield, it is considered to have considerable commercial potential. This might be achieved by its development as a variety for annual early, mid or even late season fruit production using 'long cane' or cold stored modular plants.

Other high yielding selections from the trial include **0019E2** from James Hutton Ltd. which produced a high yield and large fruit but also showed problems including poor bud break (due to lack of sufficient winter chilling) and had long laterals which, without support, were very prone to breakage. **EM6805/142** and **EM/6804/81** from EMR were very late fruiting so could be considered to be replacements for Octavia. They both produced a good yield and large berries which looked attractive in the punnet. However, the flavour of both, although better than Octavia, was not very special.

Of the guards, three selections were outstanding. **BC1-88-6** had a very high yield and high quality berries and was the highest scored selection at the open day. **WSU 1607**, a mid to late selection from Washington State, had a very large average berry size of 5.8 g, a long harvest period, distinct fruit flavour and was very popular with growers who visited the open day, along with the two other WSU selections. **0534RB1** was also rated highly by visitors to the trial. It has a wonderful flavour, a late harvest, good fruit size, good yield and high percentage marketable fruit. Also in the guard selections the three **Tulameen Pearl** clones performed well.

Potentially with support, several of these selections could be made available to growers next year. In the meantime these plots will be harvested again in 2016 to confirm the potential of these and potentially other selections.

## Technology transfer

A summer fruiting raspberry walk was held by AHDB Horticulture at the trial site on 20 July 2015 and was attended by over 10 growers and industry representatives (Figure 15). On the day, fruit was available for visitors to taste and score and guided walks around the trial plots were led by Mrs Janet Allen and Harriet Roberts of ADAS UK Ltd.

**Figure 15.** Samples of all the selections and attendees at the open day 20th July 2015

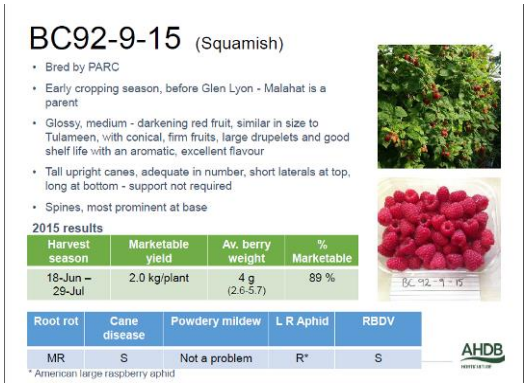



**Figure 16.** Screen shot of the SF 41d varieties presentation

A PowerPoint presentation (Figure 16) has been produced and is available on the AHDB Horticulture website http://horticulture.ahdb.org.uk/publication/presentation-raspberry-selections-ahdb-horticulture-raspberry-variety-trial.

This details all the varieties and selections involved in the trial with images of fruit on the plant and in the punnet along with key details about plant habit and management requirements and pest and disease susceptibility. This will be updated in 2016 as more is learnt about the selections. A second open day will also be held in 2016.

A PowerPoint presentation 'Promising new selections of summer fruiting raspberry varieties' was made by Mrs Janet Allen of ADAS UK Ltd at the EMRA/AHDB Soft fruit day meeting at East Malling Research on 25 November 2015.

# Appendices

## *Appendix 1: Trial plan*

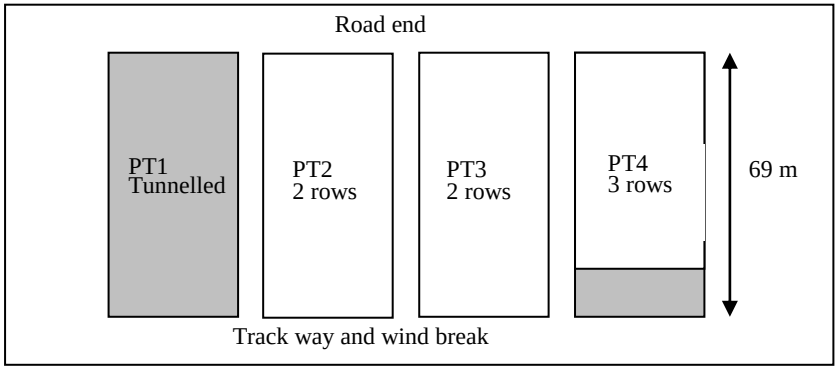
| Block 1 | | Tunnel 2 |
|---|---|---|
| Plot | Treat | Variety |
| 1 | 9 | 0447C-5 |
| 2 | 3 | BC92-9-15 |
| 3 | 8 | EM6804/81 |
| 4 | 4 | AAC Eden (KO6-2) |
| 5 | 10 | 0435D-3 |
| 6 | 11 | 0485K-1 |
| 7 | 5 | EM6803/16 |
| 8 | 2 | Tulameen |
| 9 | 1 | Octavia |
| 10 | 7 | EM6804/68 |
| 11 | 12 | 0019 E2 |
| 12 | 6 | EM6805/142 |

| Block 2 | | Tunnel 2 |
|---|---|---|
| Plot | Treat | Variety |
| 13 | 11 | 0485K-1 |
| 14 | 8 | EM6804/81 |
| 15 | 12 | 0019 E2 |
| 16 | 10 | 0435D-3 |
| 17 | 3 | BC92-9-15 |
| 18 | 5 | EM6803/16 |
| 19 | 7 | EM6804/68 |
| 20 | 9 | 0447C-5 |
| 21 | 6 | EM6805/142 |
| 22 | 1 | Octavia |
| 23 | 4 | AAC Eden (KO6-2) |
| 24 | 2 | Tulameen |

| Block 3 | | Tunnel 3 |
|---|---|---|
| Plot | Treat | Variety |
| 25 | 1 | Octavia |
| 26 | 10 | 0435D-3 |
| 27 | 6 | EM6805/142 |
| 28 | 7 | EM6804/68 |
| 29 | 11 | 0485K-1 |
| 30 | 3 | BC92-9-15 |
| 31 | 5 | EM6803/16 |
| 32 | 12 | 0019 E2 |
| 33 | 9 | 0447C-5 |
| 34 | 2 | Tulameen |
| 35 | 8 | EM6804/81 |
| 36 | 4 | AAC Eden (KO6-2) |

| Block 4 | | Tunnel 3 |
|---|---|---|
| Plot | Treat | Variety |
| 37 | 7 | EM6804/68 |
| 38 | 2 | Tulameen |
| 39 | 4 | AAC Eden (KO6-2) |
| 40 | 8 | EM6804/81 |
| 41 | 10 | 0435D-3 |
| 42 | 1 | Octavia |
| 43 | 9 | 0447C-5 |
| 44 | 6 | EM6805/142 |
| 45 | 12 | 0019 E2 |
| 46 | 3 | BC92-9-15 |
| 47 | 11 | 0485K-1 |
| 48 | 5 | EM6803/16 |

| Guards | | Tunnel 4 | | |
|---|---|---|---|---|
| | Row 1 | | Row 2 | | Row 3 |
| 1 | 0015F1 | 8 | 0550 E-4 | 15 | Glen Fyne |
| 2 | WSU 1568 | 9 | WSU 1605 | 16 | 0460 F-5 |
| 3 | Ukee | 10 | Jean d' Orleans | 17 | WSU 1607 |
| 4 | 0658 C-5 | 11 | 0534RB1 | 18 | 0427 G-7 |
| 5 | Pearl clone 299-5 (6 plants) | 12 | Pearl clone 300-5 (6 plants) | 19 | 0658 E-1 |
| 6 | BC1-88-6 | 13 | Pearl clone 301-5 (2 plants) | 20 | EM6804/42 |
| 7 | RU004 03067 | 14 | RU044 03073 | 21 | RU004 04106 |
| 22 | EM6803/16 | | | | |



***Appendix 2 - AHDB SF 41d - Descriptions of the entries***

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| **Control varieties** | | | | | |
| Tulameen (Naktuinbouw) | Mid - late 29 June – 12 August | 4.4 (5.9-3.3) | Large-very large, bright attractive, excellent flavour, even set berries. Moderate - high yield | Long-very long laterals, protected crop needs lateral support. Bud break down length of canes. Some spines, upright-spreading very tall cane, moderate in number, some spines. | Very susceptible to raspberry root rot, also spur blight & cane botrytis |
| Octavia | Late 1 July – 12 August | 5.0 (7.8-3.1) | Large round-conical berries, moderate flavour, pink berries with salmon undertones, reasonably bright, variable drupelet size & berry shape, berry can be uneven in shape. Moderate shelf life | Long - very long laterals, variable bud break mainly top - middle of canes, needs lateral support as protected crop. Spines especially noticeable on primocane. | Has A10 but is very susceptible to raspberry root rot, also cane blight |
| **From: East Malling Research** | | | | | |

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| EM6803/16 | Late<br>29 June – 10 August | 4.7<br>(6.4-3.4) | **A high percentage of the plants in each plot not true to type**, producing multi-branched canes & round, crumbly fruit. True to type plants have round-conic good size fruit, moderate -good flavour higher brix than G. Ample in EMR trials. Moderate -poor shelf-life | Vigorous, glabrous canes with long ascending laterals becoming drooping as fruit ripens, can break at top of canes, but lateral support may not be needed. Most laterals top-middle of canes. Spiny but most spines are not very prominent, very upright habit, vigorous plant. | Has A10 |
| EM6804/68 | Mid-Late<br>1 July – 3 August | 4.4<br>(6.5-3.2) | Firm fruits conical of good colour and easy to plug, a bit uneven in shape. Moderate flavour, like Octavia but higher Brix, moderate shelf life | Vigorous, glabrous canes with long ascending laterals becoming drooping as fruit ripens. Laterals roll over each other, needs lateral support<br>Spiny but most spines are not very prominent, upright cane, moderate vigour | A10 |
| EM6805/142 | Late<br>1 July-12 August | 5.1<br>(7.2-3.8) | Large firm attractive fruits; pale with good shelf-life. Moderate flavour | Vigorous, late emerging glabrous upright canes. The bottom half of the cane can be a bit bare. Long ascending laterals multi-flowered, strongly attached, may need lateral support. Good fruit presentation and easily plugged | A10 |

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| EM6804/81 | Late 29 June – 12 August | 4.8 (6.6-3.6) | Very firm, attractive fruits with excellent shelf-life. Fairly good flavour | Moderate vigour with late emerging glabrous canes. Laterals long, most top to mid-cane, laterals break & roll over need lateral support, fruit easily plugged Canes very upright, vigorous, spiny but most spines are not very prominent, | A10 |
| **EMR Guard** | | | | | |
| EM6804/42 | Mid 29 June – 5 August | 4.1 (5.4-3.4) | Firm fruits of good colour, higher brix & flavour than Octavia. Fairly good shelf-life | Vigorous, glabrous canes with long horizontal laterals. The fruit is well presented and easy to plug Spines | A10 |
| **From: James Hutton Ltd.** | | | | | |
| 0435D-3 | V. early 18 June – 3 August | 3.8 (5.8-3.8) | Neat, conical fruit with moderate flavour at times sweet & aromatic high yield. Good shelf life | Bud break full length of cane, short to med length laterals, strongly attached no lateral support required Productive over a long season Upright - spreading tall canes Spine free cane moderate vigour | Not known |

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| 0485K-1 | Early -Mid 26 June – 3 August | 4.7 (6.5-2.6) | Large, conical fruit, very glossy and very attractive in punnet, darken as ripen High yield at JHI 2 kg/plant good flavour, good shelf life | Bud break top -mid cane only. Tall, upright to spreading canes, vigorous. Requires lateral supports. Otherwise easy and cheap to pick, easy to manage Spine free cane. | Has A10 & Gene H tolerance to cane botrytis & spur blight, very susceptible to raspberry root rot |
| 0019 E2 | Mid-late 1 July – 12 August | 4.9 (7.1-3.8) | Very large conical fruit, large drupes, cohesive, but looks a little unevenly set, good shelf-life moderate to good –moderate flavour, high yield | Tall stout upright cane, easy to manage, fruit laterals very long need support as readily can break. Uneven bud break top-mid cane only, due to lack of winter chilling Spine free. | Has A10 |

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| 0447C-5<br>(Glen Dee) | Mid-Late<br>26 June – 12 August | 5.4<br>(7.6-3.9) | Large, conical fruit with pleasant flavor Brix 8.0. Good shelf life. Consistent high yield. Fruit a bit uneven in set does not look very neat in punnet, bright appearance | Very long laterals, mostly top to middle of cane, droop at tip, fruit well displayed to pickers, strongly attached, lateral support not required<br>Tall stout canes, upright habit, adequate number<br>Spine free<br>Variable date of bud burst so majority of canes completed harvest just before that of Octavia | Has A10 |
| **James Hutton Ltd. Guards** | | | | | |
| 0460F-5 | Mid<br>3 July – 5 August | 4.2<br>(5.5-3.4) | Attractive but rather dark, even set, conical fruit, shiny. Good flavour, Brix 10. Good shelf life | Laterals top to bottom of canes, medium-long droop with weight of fruit but good presentation. Very upright cane habit adequate in number<br>Spine free | A10 |

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| 0658C-5 | Early-Mid<br>26 June – 10 August | 4.7<br>(6.0-3.4) | Conical fruit, variable size & shape, bright, a bit pale, high yield, moderate to good flavour can be good, fruity, juicy, 'raspberry' and 'elderflower' notes Brix 8.6. Good shelf-life | Laterals short to very long at cane base, bow over but display fruit well lateral support may be required. Plentiful supply of tall cane vigorous upright-spreading cane.<br>Spine free | A10 |
| 0658E-1 | Early-Mid<br>26 June – 29 July | 4.8<br>(7.0-3.4) | Bright, conical<br>Sweet, fruity, juicy, 'raspberry' and 'elderflower' notes. Not as good a flavour as Tulameen<br>Good shelf-life | Laterals full length of canes, short at top, medium-long at base, well displayed, a few laterals broken but lateral support may not be required. Medium vigour, upright-spreading canes, adequate number Spines | **Moderate resistance to root rot**<br>(no symptoms after 3 years at JHI) |
| Glen Fyne | Mid<br>3 July – 5 August | 3.5<br>(5.0-2.6) | Medium sized round-conical berries (some variability in berry set) bright, very sweet, good flavour, Brix 8.6, good shelf life, berries darken when fully ripe, poor yield in 2015, good shelf life | Medium -long laterals, strongly attached, lateral support not required. Bud break down length of canes. Spine free cane spreading, difficult to keep upright, no spines, moderate vigour & cane number. | Has A10 very susceptible to raspberry root rot & powdery mildew |
| 0427G-7* | Mid<br>(*not fruiting in 2015)* | ? | Bright fruit with a round shape. Shelf-life very good, maintains colour and uniformity | Spines and Gene H, hairy cane phenotype | ? |

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| 0534RB1 | Mid – Late 26 June – 12 August | 5.2 (6.5-4.2) | Very large, conical fruit, reasonably bright, with very sweet excellent flavour, Brix 10.3 (consistently higher than that of Tulameen), high yield, good shelf life | Medium-long laterals at top-middle & very long at base, laterals full length of canes. Bow over a bit with fruit weight, but support not required. Tall stout canes, upright-spreading, moderate vigour. Spine free | A10 |
| 0550E-4 | Mid – Late 29 June – 10 August | 3.7 (5.6-2.4) | Firm fruit, rather dark when fully ripe, conical, slightly hairy (makes it look dull), moderate to good flavour. Shelf-life good, maintains colour and firmness. Moderate yield. | Laterals medium-long at top to long-very long at base, full length of canes. Fruit well displayed to pickers support unnecessary. Adequate numbers of medium to tall cane, upright-spreading habit Spine free, but hairy canes | A10 and **moderate resistance to root rot** (No symptoms. after 3 years at James Hutton Ltd). Has Gene H phenotype tolerance to cane botrytis & spur blight, |

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| 0015 F1 | Mid - Late<br>29 June – 29 July | 3.5<br>(4.4-2.6) | Fruit is conical, pale-mid red, slightly dull when fully ripe, moderate - good flavour, good shelf life | Short- Medium - long laterals, most at top to mid-cane, bow over with ripe fruit needs lateral support. Very open cane canopy, Tall cane, medium diameter, moderate in number, upright habit -spreading and a neat lateral presentation<br>Spine free | **Moderate resistance to root rot**<br>(no symptoms after 3 years at James Hutton Ltd.) |
| **From: Pacific Agri-Food Research Centre** | | | | | |
| BC92-9-15<br>(Squamish) | V. early<br>18 June – 29 July | 4.0<br>(5.6-2.6) | Glossy, medium sized, darkening red, conical, reasonably firm, large drupelets, cohesive, good aromatic flavour, Brix 10.5 consistently higher than that of Tulameen, good shelf life. High yield | Laterals full length of canes short at top - long at base, present fruit well, lateral support not required. Tall upright -spreading canes, adequate number<br>Spines, most prominent at base | Good field resistance to root rot |

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| AAC Eden (KO6-2) | Early – Mid 18 June – 10 August | 4.8 (7.4-3.3) | Fruit size greater than Tulameen. Firm, neat conic, but not glossy (looks a bit greasy) light –mid red, good flavour, easy to pick, softer than Squamish. Some variability in fruit set & shape suspect off types planted. Yield good but less than that of & shelf life not as good as Squamish. | Long laterals, most laterals at top-middle of canes. Ascending-horizontal pose, strongly attached, present fruit well to pickers. Support not required. Very upright, spine free tall, adequate number, vigorous cane. | Not Known |
| **Pacific Agri-Food Research Centre Guards** | | | | | |
| BC1-88-6 | Early – Mid 1 July – 3 August | 4.9 96.1-2.6 | Fruit large long-conical, very bright, small drupelets, cohesive, mid red, good flavour, Brix 9.4 & good shelf life | Upright to spreading habit, tall, stout, high numbers. Long fruit laterals fruit easy to find & detach. Spines | Not Known |
| Tulameen Pearl Clone 299-5 | Mid - Late 3 July – 10 August | 5.0 (6.6-4.2) | Like Tulameen | Like Tulameen, | As per Tulameen in main trial |
| Tulameen Pearl Clone 300-5 | Mid - Late 29 June – 12 August | 4.9 (6.1-3.7) | Like Tulameen | Like Tulameen, | " |
| Tulameen Pearl Clone 301-5 | Mid - Late 3 July – 10 August | 5.4 (6.7-4.5) | Like Tulameen | Like Tulameen, | " |

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| Ukee<br>(BC92-6-41) | Early – Mid<br>1July – 3 August | 3.5<br>(5.0-2.8) | Fruit smaller than Tulameen, conical, small drupelets, very cohesive, light red, moderate flavour. Good shelf life. Some variability in drupelet size & as consequence variable fruit set | Tall cane, upright, vigorous, adequate in number, more upright than Tulameen, strong long laterals, full length of canes, present fruit well. But bow over so lateral support required<br>Spines | **Tolerant of Root rot** |
| Jeanne d'<br>Orleans | Mid<br>1 July – 3 August | 3.1<br>(4.0-1.2) | Medium – large fruit neat, small even sized & shaped drupelets, well set very cohesive, firm, mid red, excellent sweet lingering flavour, aromatic | Medium-tall, upright – spreading canes, short -medium length ascending laterals which present fruit very well to pickers<br>Spines | Resistant to powdery mildew |
| **From: Washington State University (WSU)** | | | | | |
| **WSU Guards** | | | | | |
| WSU1605 | Mid-Late<br>3 July – 12 August | 5.5<br>(7.4-4.5) | Very large fruited, long conical, glossy, cohesive a bit variable in shape, firm, easily detached, good flavour, good shelf life high yield. | Top laterals medium-long all others very long, bow over with weight of & hides fruit, needs lateral support. Laterals full length of canes. Upright-spreading, tall, stout canes. Leafy, vigorous<br>Spines | Not Known |
| WSU1568 | Mid<br>3 – 29 July | 4.3<br>(6.0-3.2) | Large long conical, firm, glossy, well flavoured fruit, easily picked, good shelf life. High yield. | Long-very long laterals, bow over each other so lateral support required, laterals down full length of canes. Canes tall, stout, very upright, adequate in number<br>Spines | Not known |

| Cultivar/ Selection | Harvest period SF41d in 2015 | Fruit Size Average (Max-min) SF41d 2015 (g) | Fruit | Plant | Pest & Disease susceptibility |
|---|---|---|---|---|---|
| WSU1607 | Mid – Late<br>3 July – 5 August | 5.8<br>(7.9-4.6) | Large, long conical, glossy, very firm, good flavoured fruit, with excellent shelf life, easily detached from laterals. | All laterals very long, roll over with weight of fruit need lateral support. Tall upright & stout, adequate in number<br>Spines | Not known |
| **From: Graminor AS, Norway (Plant breeders information)** | | | | | |
| **Graminor Guards** | | | | | |
| RU044 03073* | Early-mid | | Berries firmer with better shelf life than Glen Ample. Darker colour but better taste than Ample | Very strong against raspberry leaf and bud mite, susceptibility to cane diseases as Glen Ample. No winter damage problems observed up to know.<br>Spine free | strong against raspberry leaf and bud mite |
| RU004 04106* | Early–mid | 5.3 g | Berries smaller than Glen Ample but berries are firmer and have much better taste than Glen Ample. Conic shape with good colour | Habit description to come<br>Spine free | |
| RU004 03067* | Early-mid season | | Berries with lighter colour than Glen Ample, quite similar scores for appearance and taste. higher yielding than Glen Ample | More susceptible to frost damage than Glen Ample. Spine free | strong against raspberry leaf and bud mite, susceptible to cane diseases |

*Planted in 2014 - not cropping until 2016

***Appendix 3 – Meteorological records September 2014 to September 2015***

Weekly maximum, minimum and average temperature and precipitation recorded at RAF Benson 15 miles from the trial site