Project title:	East Malling Strawberry Breeding Club
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Project leader:	Adam Whitehouse, East Malling Research
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Key staff:	David Simpson Adam Whitehouse Abigail Johnson
Location of project:	East Malling Research New Road East Malling Kent ME19 6BJ
Industry Representative:	Harriet Duncalfe
Date project commenced:	1st June 2008
Date project completed (or expected completion date):	31st May 2013

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.

[Name]
[Position]
[Organisation]

Signature ..... Date .....

[Name]
[Position]
[Organisation]

Signature ..... Date .....

Report authorised by:

[Name]
[Position]
[Organisation]

Signature ..... Date .....

[Name]
[Position]
[Organisation]

Signature ..... Date .....

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GROWER SUMMARY

Headline

Four selections from the East Malling Strawberry Breeding Club (EMSBC) programme are currently being commercialised, with three of these now named and released to the industry: 'Malling™ Centenary' (EM1764), 'Serenity' (F62) and 'Buddy' (EMR428) and another (EMR470) currently undergoing commercial trials.

Background

The East Malling Strawberry Breeding Club (EMSBC) was established in 2008 with funding from both public and private sources, of which HDC contributed via project SF 96. The main objective of the EMSBC strawberry breeding programme is to develop improved strawberry varieties, both June-bearers and everbearers, with:

- Increased yield
- Larger fruit size
- An extended season of production
- Greater resistance to fungal diseases.

This final report summarises the outputs from this project with particular emphasis on the EMSBC trials (June-bearer maincrop, 60-day and everbearer trials) that were carried out at East Malling Research. Details of each of the selections that have progressed to and remain in advanced trials as well as those that have been fast-tracked to commercialisation are described in detail in the Science Section.

Summary of the project and main conclusions

Between 2008 and 2013 the East Malling Strawberry Breeding Club programme performed 862 crosses, assessed over 75,500 strawberry seedlings, selected and evaluated over 650 lines, and identified 48 advanced selections for proceeding to growers' trials. From these selections, nine are currently being assessed on preliminary growers' trials, and five have progressed to large-scale trials. A further four selections, two June-bearers (EM1764 and F62) and two everbearers (EMR428 and EMR470) are being commercialised, with three of these now named and released to the industry: 'Malling™ Centenary' (EM1764), 'Serenity' (F62) and 'Buddy' (EMR428). A summary table outlining the scale of the programme (2008-13) is shown below:

Process	June-bearers	Everbearers	Totals
Crosses performed	593	269	862
Seedlings assessed	44,939	28,599	73,538
Number of selections:			
Selected from seedlings[1]	461	180	641
Assessed in preliminary trials at EMR[2]	464	188	652
Progressed to growers' trials	33	15	48
Progressed to large-scale trials	4	1	5
Progressed to commercialisation	2	2	4

[1]These are the number of plants selected between 2008 and 2012 and evaluated in preliminary EMR trials two years later, whereas[2] represents the number of selections evaluated between 2008 and 2012, including selections that were already in trial in 2008 when the EMSBC was formed.

Descriptions of the three selections that have been released between 2008 and 2013, along with details of a further selection currently undergoing commercialisation and final assessment in commercial trials is shown below:

- **'Malling™ Centenary'** (EM1764) is an early-mid season June-bearer, with excellent overall fruit quality. Berries are firm and attractive with very regular shape and excellent flavour. It has good fruit size and very high percentage Class 1. Brix and shelf life are similar to 'Elsanta'. Maincrop yield in EMR trials was lower than for 'Elsanta' but 'Malling™ Centenary' has a higher percentage of both Class 1 fruit and large (>35mm) berries. Plants have a similar vigour to 'Elsanta', but fruit is better displayed. Preliminary tests at EMR suggest that 'Malling™ Centenary' does not have strong resistance to any diseases. 'Malling™ Centenary' was also independently trialled in substrate in 2011 as part of HDC project SF 128, where it gave an excellent performance in terms of yield and fruit quality. 'Malling™ Centenary' is being commercialized by Meiosis Ltd. on behalf of the EMSBC and will be available to all growers in autumn 2014.

- **'Serenity'** (F62). A variant of the popular late-season June-bearer variety 'Florence'. 'Serenity' has many of the the beneficial attributes of 'Florence' but with a lighter skin colour. The average fruit size and percentage of Class 1 fruit is similar to both 'Florence' and 'Elsanta' and 'Serenity' has shown good yield potential in maincrop production, (1.3kg/plant of Class 1 fruit in the 2009 EMR trial). Berries are firm and juicy, with a pleasant flavour and good Brix levels. The plants of 'Serenity' are less vigorous and less dense than 'Florence', and have a good fruit display. Like 'Florence', 'Serenity' shows a high level of resistance to crown rot, *Verticillium* wilt and powdery mildew. 'Serenity' was released in 2012 and is being commercialised and propagated by Hargreaves Plants Ltd. on behalf of the EMSBC.
- **'Buddy'** (EMR428). An everbearer variety that has outstanding fruit quality characteristics. It has firm, attractive, glossy berries that have a good shape and colour. Eating quality is excellent with a good balance of sugar and acid and high Brix levels. Shelf life is good, and superior to the standards. Yield is moderate but with a good percentage of large fruit. Plants have moderate vigour and runner production. 'Buddy' shows a useful level of crown rot resistance based on trials at EMR. 'Buddy' was released in 2012 and is being commercialised and propagated by Hargreaves Plants Ltd. on behalf of the EMSBC.
- **EMR470**. An early Everbearer with an excellent flavour that is consistently sweet throughout the season. It has a high percentage of Class 1 fruit and good yield potential. Berries are firm and glossy with a good regular shape. The plants have moderate vigour, with good fruit display and show a useful level of resistance to powdery mildew. EMR470 scored well in shelf life tests in 2011 and Brix levels have been consistently high. EMR470 is to be commercialized by Meiosis Ltd. on behalf of the EMSBC and pending the results of commercial-scale trials will be available to growers in the near future.

Five advanced selections showed potential in both the EMR and preliminary growers' trials between 2008 and 2013 and have now progressed to large-scale growers' trials where their commercial potential will be assessed between 2013 and 2016:

- **EM1746** is a mid-late season June-bearer selection. It has a good yield, high percentage Class 1 fruit, attractive and sweet-tasting fruit. It is being reassessed in large-scale growers' trials in 2013/14**.**

- **EM1974** is a mid-season June-bearer which has had consistently good flavour in all trials. It has a good yield, high percentage of Class 1 fruit of excellent appearance. It will be reassessed in large-scale growers' trials in 2015/16.
- **EM1990** is a mid–late season June-bearer, with a season about 4 days later than 'Elsanta'. It has very attractive, glossy berries with a regular shape, good colour and pleasant flavour. It will be reassessed in large-scale growers' trials in 2015/16.
- **EM1996** is a high-yielding, mid-late season June-bearer that has attractive, regular-shaped berries with shelf-life that is superior to 'Elsanta'. EM1996 performed well in both 60-day and maincrop growers' trials and has been fast-tracked for assessment in large-scale growers' trials in 2013/14.
- **EMR489** is an early-season everbearer that has the majority of its production in July and early-August. It has yielded >1kg/plant in both EMR and preliminary growers' trials, with the fruit being firm, glossy and with a good flavour. Preliminary disease screening tests at EMR suggest it has a useful level of resistance to both *Verticillium* wilt and crown rot. EMR489 is currently in propagation for large-scale growers' trials in 2014.

In addition, nine new selections that were identified between 2008 and 2013 are currently in preliminary growers' trials and will be assessed between 2013 and 2015.

Financial benefits

- Improved fruit size and fruit display combined with low percentage waste, as produced by 'Buddy' and 'Malling™ Centenary', will lead to reduced picking costs.
- Improved fruit quality traits (flavour, appearance, shelf life) will increase the marketability of fruit due to widespread acceptance and approval by retailers and customers.
- Extension of the growing season using early and late season varieties such as 'Malling™ Centenary' and 'Serenity' respectively, will allow growers to produce fruit economically during periods when demand is high.
- Excellent disease resistance, as demonstrated by 'Serenity' allows production with reduced pesticide applications.

- UK propagators will benefit through the opportunity to produce plants of these cultivars to satisfy demand from the UK and overseas.

Action points for growers

- 'Malling Centenary' offers an early-mid season June-bearing cultivar that has a high percentage of Class 1 fruit, combined with excellent fruit quality, with consistently sweet flavour and attractive appearance. It performs well in soil and soilless substrate culture. 'Malling Centenary' is being commercialised by Meiosis Ltd (www.meiosis.co.uk) on behalf of the EMSBC.
- 'Serenity' offers a late-season alternative to 'Florence' where a paler-skinned berry is required. It shares many of the attributes of its progenitor 'Florence' which became a widely accepted cultivar for growers in Northern Europe due to its late season and multiple disease resistance. 'Serenity' is being commercialised and propagated by Hargreaves Plants Ltd. (www.serenitystrawberry.com) on behalf of the EMSBC.
- 'Buddy' offers all sectors of the industry an everbearing variety with excellent eating quality, high sugars and large fruit size. These combined attributes make it a suitable variety for all market outlets. 'Buddy' is being commercialised and propagated by Hargreaves Plants Ltd. (www.buddystrawberry.com) on behalf of the EMSBC.
- Advanced selections identified by the EMSBC programme as being suitable for growers' trials will continue to be trialled as part of the HDC-funded variety trials and if released will, in due course, be available to all growers.
- HDC-levy payers have the opportunity to sample and discuss advanced selections and released varieties from the EMSBC programme at an annual HDC-organised growers' walk at East Malling Research, Kent in June of each year.

SCIENCE SECTION

Introduction

The EMSBC was formed in 2008 to continue the national strawberry programme that has operated at EMR since 1983. The programme received funding from both public (Defra Project FO0313 - Development of improved cultivars to reduce environmental impact of strawberry production in the UK) and private sources (BerryGardens Growers Ltd., CPM Retail Ltd, East Malling Ltd, European Strawberry Nurseries Association, Mack Multiples Ltd. and United Kingdom Strawberry Association (Coordinated by Meiosis Ltd.). The HDC contributed to the EMSBC via project SF 96. The main breeding objectives of the programme for 2008-13 were:

- Improve 60-day cropping performance

  (50% higher yields than 'Elsanta')

- Produce high yielding June-bearers

  (15% higher than 'Elsanta')

- Improve the proportion of % Class 1 fruit

  (>90% for June-bearers)

- Increase fruit size

  (>60% and >65% of berries being larger (35mm) for June-bearers and everbearers respectively)

- Develop everbearers with excellent fruit quality

- Extend the season of production

  (Improved early and late-season June-bearers)

- Increase resistance to fungal diseases

  (Powdery mildew, *Verticillium* wilt, crown rot and black spot)

This report covers the progress of the EMSBC programme from 2008-13 with an emphasis on the results of the preliminary trials that have been performed at EMR. Three trials (June-bearer maincrop, 60-day and everbearer) were assessed annually for the East Malling Strawberry Breeding Club (EMSBC).

Materials and methods

Crossing programme

During the course of the project, an annual crossing programme was completed during February-April in controlled glasshouse conditions (22-22°C/15-17°C day/night, 16hr supplementary lighting) at EMR. Details of the type and number of crosses made each year are shown in Table 1.

Table 1. Number of crosses by year (2008-13)

	2008	2009	2010	2011	2012	2013*	Totals
June-bearer (Early)	5	5	7	21	30	8	76
June-bearer (Mid)	61	61	70	51	72	66	381
June-bearer (Late)	20	44	19	28	13	12	136
Everbearer	37	57	50	43	50	32	269
Totals	123	167	146	143	165	118	**862**

*Seedlings raised from 2013 crosses will be assessed in 2014 during tranche 2 of the EMSBC

Seedling selection

In 2008 there was a pipeline of material from the previous programme comprising seedling populations of both June-bearer and everbearers. June-bearer seedling populations were raised from seed in May following the annual crossing programme and planted into fumigated (chloropicrin) raised beds in an open field between late-July and early August of each year. Everbearer seedling populations were raised annually in June, overwintered in a non-heated polytunnel and planted out into fumigated (chloropicrin) raised beds in an open-field between late-March and early-April.

The June-bearer seedling populations were assessed weekly between May and July of each year, while the everbearer seedlings were deblossomed in mid-May and assessed weekly between July and September. Seedlings displaying a combination of desirable traits associated with fruit quality, yield, fruit size, plant architecture and disease-resistance were selected for assessment in preliminary trials at EMR. The number of seedlings assessed between 2008 and 2013 are shown in Table 2:

Table 2. Number of seedlings assessed and selections by year (2008-13)

	2008	2009	2010	2011	2012	*2013**	Totals*
June-bearer	8,852	9,360	8,063	7,748	10,916	*8,121*	44,939
Everbearer	4,182	4,870	7,762	5,934	5,851	*5,534*	28,599
Totals	13,034	14,230	15,825	13,682	16,767	*13,655*	**73,538**

*Seedlings for the 2013 seedling populations were planted during HDC project SF 96 (tranche 1 of the EMSBC), but will be assessed as part of the HDC SF96a (tranche 2) in summer 2013 and so have not been included in the totals

Preliminary trials (EMR)

All the preliminary trials were performed on the Ditton Rough plot (sandy loam soil) at East Malling Research, New Road, East Malling, Kent, ME19 6BJ. Each trial was planted as double rows at 0.6 m spacing into fumigated raised beds with polythene mulch and trickle irrigation. These beds were covered prior to flowering with polythene clad tunnels for rain protection and also with netting against bird damage.

Maincrop (June-bearer) trial

The maincrop trials contained between 68-123 new selections, up to nine advanced selections, and four standards and were established from misted tips planted at the end-July through to August (Table 3.a.).

Table 3.a. Planting dates and number of new and advanced selections assessed in the EMR maincrop trial, 2008-13.

	2008	2009	2010	2011	2012	*2013**	Totals*
Planting date	*8 Aug 07*	*5 Aug 08*	*28 Jul 09*	*3 Aug 10*	*2 Aug 11*	*28 Aug 12*	
New selections	68	120	108	79	89	*76*	464
Advanced selections	0	1	9	7	8	*7*	25
Totals	68	124	124	87	97	*101*	**500**

*Selections for the 2013 trials were planted during HDC project SF 96 (tranche 1 of the EMSBC), but will be assessed as part of the HDC SF96a (tranche 2) in summer 2013 and so have not been included in the totals

60-day (June-bearer) trial

Plants were propagated in nursery beds established at the end of July by 'pinning-down' primary and secondary runners from maincrop (June-bearer) trial plants that had finished fruiting. Runners were lifted and graded in December and stored at -2°C until planting. Single-crowned plants with crown diameter measurements within the median range of those measured for each selection were chosen as trial plants. The trial was planted during the third or fourth week of May into fumigated (chloropicrin) raised beds and covered by polythene clad tunnels for rain protection and netting for bird protection. Each trial was maintained for a single cropping season and a standard commercial spray programme was used to control pests and diseases. 'Elsanta' was used as the main standard cultivar and other standards were chosen as appropriate for each trial, including 'Elegance', 'Sonata' and 'Florence'. Selections were planted in a single 10-plant plot (6-plant plots from 2010) using a randomised design. There were two replicate plots of 'Elsanta' and a single plot of the other standard varieties. From 2010 onwards it was agreed by the EMSBC Board that only advanced selections would be assessed in the 60-day trial and that only six plants per plot would be used. The numbers of selections assessed each year are shown in Table 3.b.

Table 3.b. Planting dates and number of selections assessed in the EMR 60-day trial, 2008-13.

	2008	2009	2010	2011	2012	*2013**	Totals*
Planting date	*15 May 08*	*19 May 09*	*20 May 10*	*17 May 11*	*23 May 12*	*15 May 13*	
Selections	25	38	11	9	3	*9*	95

*Selections for the 2013 trials were planted during HDC project SF 96 (tranche 1 of the EMSBC), but will be assessed as part of the HDC SF96a (tranche 2) in summer 2013 and so have not been included in the totals

Everbearer trial

During each year of the project, plants were propagated as misted tips at the end of July, potted on after 8 weeks into 9cm pots and then over-wintered in a polythene clad tunnel. Each trial was planted during the period from mid-March to early April of the following year (Table 3.c.) with 10-plant plots on fumigated (chloropicrin) raised beds with opaque polythene mulch and trickle irrigation. These plots were covered by polythene clad tunnels for rain protection and netting for bird protection. Each trial was maintained for a single cropping season and a standard commercial spray programme was used to control pests and diseases. Plants were de-blossomed during the third week of May of each year and harvesting began at the end of June and continued twice weekly until the end of September.

The everbearer trials contained between 28 and 45 new selections, up to five advanced selections, and four standards (Table 3.c). ‘Finesse’ and ‘Evie-2’ were used as standard cultivars and other standards were chosen as appropriate for each trial – these included ‘Diamante’, ‘Everest’ and ‘Charlotte’. New selections and untested foreign lines or cultivars were planted in a single 10-plant plot but advanced selections and standards were replicated in two blocks, using a randomised design.

Table 3.c. Planting dates and number of new and advanced selections assessed in the EMR everbearer trial, 2008-13.

	2008	2009	2010	2011	2012	*2013**	Totals*
Planting date	*10 Apr 08*	*31 Mar 09*	*30 Mar 10*	*29 Mar 13*	*28 Mar 13*	*20 Mar 13*	
New selections	28	45	36	36	43	*30*	188
Advanced selections	0	5	2	5	3	*4*	15
Totals	28	59	35	38	46	*32*	**206**

*Selections for the 2013 trials were planted during HDC project SF 96 (tranche 1 of the EMSBC), but will be assessed as part of the HDC SF96a (tranche 2) in summer 2013 and so have not been included in the totals

Fruit and plant assessments (EMR)

Each trial was harvested twice weekly, on Mondays and Thursdays, and the fruit was graded by the pickers into four categories:

- Class 1 >35 mm
- Class 1 25-35mm
- Small 18-25mm
- Class 2 and unmarketable

At each harvest, the quality of the fruit was evaluated by a panel of experienced breeders. Using subjective 9-point scales, a score was given for appearance, skin and flesh firmness, flavour and an overall comparison with the standard (selection index). For the promising selections, samples of 15 berries (10 for everbearers) were taken at a minimum of three harvests and placed in a controlled environment cabinet for one day at +4°C days followed by three days at 18°C. The samples were then assessed for deterioration in comparison with the standards. Brix measurements were also taken from fresh berries of the promising selections on at least three occasions per season. The vegetative characteristics of the plants were recorded once per season and any disease symptoms were noted.

All data were recorded in a Microsoft Access database. Analysis procedures were developed to produce summary tables showing the relative performance of lines in each trial and to provide a detailed record for each selection.

Growers' trials

The EMSBC members were presented with trial data from the maincrop trial at a Board meeting in June, and the 60-day and everbearer trial data in August of each year. They collectively agreed which selections should progress to preliminary trials on commercial farms. These trials were organised by EMSBC members, typically on five sites. Replicated plots were planted using 60 plants per selection on each site and included assessment as both 60-day and maincrop plantings.

The data from these trials, in conjunction with the data gathered at EMR, was considered by EMSBC members at meetings in August and October of each year that the preliminary growers' trials were assessed. A decision was then made on how each advanced selection should progress. The options for each selection were

to: reject (no further trials), proceed to large-scale growers' trials (maximum of 2,500 plants at two-three commercial farms) or fast-track to commercialisation.

Results

Maincrop and 60-day (June-bearer) trials

A total of 464 new selections were trialled in the maincrop June-bearer trial at EMR between 2008 and 2012 (excluding 2013 trials which were planted in 2012 but will be assessed under tranche 2 of the EMSBC contract). Of these, 28 selections were identified for progression to preliminary growers' trials following the results of the EMR trials. All 28 selections will have gone forward for assessment in the EMR 60-day trials. However fourteen of these advanced selections (Table 4) were subsequently deselected by the Club Board as they were subsequently found to be either susceptible to disease and/or poorly adapted to commercial growing systems (poor plant habit, low yield, and/or inferior fruit quality). Of the fourteen remaining advanced selections, three (EM1998, EM2044, and EM2056) are currently being assessed in preliminary growers' trials (2013-14), with another five (EM1977, EM2131, EM2156, and EM2161) being propagated for assessment in 2014 and 2015. A further four selections have progressed to large-scale growers' trials and will be assessed in 2013-14 (EM1746), 2014-15 (EM1996) and 2015-16 (EM1974 and EM1990). Additionally two selections (EM1764 and F62) were fast-tracked to commercialisation and release. EM1764 has subsequently been released (2013) as 'Malling™ Centenary' and is being commercialised by Meiosis Ltd., while F62 has been released (2012) as 'Serenity' and is being commercialised by Hargreaves Plants Ltd. The current status of all the advanced selections that were identified between 2008 and 2013 (Table 4), along with descriptions of those selections that remain in trial or have been released, are shown below:

Table 4. The current status of advanced Jun-bearer selections that were identified and trialled between 2008 and 2013. Descriptions of those shown in **BOLD** appear below the table.

Selection	Year in trial		Current status
	EMR[1]	Growers'	
EM1727	2008-10	2010-11	Rejected 2011 following growers' maincrop trial
EM1733	2008-10	2010-11	Rejected 2011 following growers' maincrop trial
EM1746	**2008-10**	**2010-11**	**Progressed to large-scale growers trials in 2013-14**
EM1752	2008-10	2010-11	Rejected 2011 following growers' maincrop trial
EM1756	2008-10	2010-11	Rejected 2011 following growers' maincrop trial
EM1764	**2009-11**	**2011-12[2]**	**Released as 'Malling™ Centenary' in 2013**
EM1774	2008-10	2010-11	Rejected 2011 following growers' maincrop trial
EM1786	2008-10	2010-11	Rejected 2011 following growers' maincrop trial
EM1792	2009-11	2011-12	Rejected 2012 following growers' maincrop trial
EM1832	2009-11	2011-12	Rejected 2012 following growers' maincrop trial
EM1856	2009-11	2011-12	Rejected 2012 following growers' maincrop trial
EM1860	2009-11	2011-12	Rejected 2012 following growers' maincrop trial
EM1871	2009-11	2011-12	Rejected 2012 following growers' maincrop trial
EM1942	2010-11	2012-13	Rejected 2013 following growers' maincrop trial
EM1966	2010-11	2012-13	Rejected 2013 following growers' maincrop trial
EM1967	2010-11	2012-13	Rejected 2013 following growers' maincrop trial
EM1974	**2010-12**	**2012-13**	**Progressed to large-scale growers' trials in 2015-16**
EM1977	**2010/12-13**	**2014-15**	**Progressed to preliminary growers' trials in 2014-15**
EM1990	**2010-12**	**2012-13**	**Progressed to large-scale growers' trials in 2015-16**
EM1996	**2010-12**	**2012-13**	**Fast-tracked to large-scale growers' trials in 2014-15**
EM1998	**2011-13**	**2013-14**	**Progressed to preliminary growers' trials in 2013-14**
EM2044	**2011-13**	**2013-14**	**Progressed to preliminary growers' trials in 2013-14**
EM2056	**2011-13**	**2013-14**	**Progressed to preliminary growers' trials in 2013-14**
EM2131	**2012-13**	**2014-15**	**Progressed to preliminary growers' trials in 2014-15**
EM2135	**2012-13**	**2014-15**	**Progressed to preliminary growers' trials in 2014-15**
EM2156	**2012-13**	**2014-15**	**Progressed to preliminary growers' trials in 2014-15**
EM2161	**2012-13**	**2014-15**	**Progressed to preliminary growers' trials in 2014-15**
F62	**2009-10**	**2011-12[2]**	**Released as 'Serenity' in 2012**

[1]Including 60-day, maincrop and recycled, [2]Commercial trials

A description of each of the advanced selections follows (in alphanumeric order):

EM1746 (mid-late season June-bearer)

The production profile of EM1746 is intermediate between 'Elsanta' and 'Florence' Berries are attractive with a glossy appearance, good, regular shape and a pleasant, sweet flavour. Brix levels have averaged out at 8.6 across all EMR trials, and shelf life has been similar to the standard 'Elsanta'. EM1746 has produced yields comparable to 'Elsanta' in maincrop trials both at EMR and in HDC trials, with a high percentage of Class 1 fruit (average 90%) and large fruit size (66% >35 mm in 2010 EMR trial). The 60-day yield from EM1746 was shown to be higher than 'Elsanta' in EMR trials (235g/plant in 2009 compared to 180g/plant from 'Elsanta'). Plants have moderate vigour, and a slightly denser habit than 'Elsanta', but fruit display is very good. Preliminary tests at EMR suggest that EM1746 has some resistance to Verticillium wilt and crown rot, but powdery mildew has been seen on some plants on some growers' sites.

EM1746 was also trialled in 2011 as part of HDC project SF 92a (Creed, 2011) where it gave the highest yield of all the late-season varieties tested.

EM1746 has progressed to **large-scale growers' trials in 2014 and 2015.**

Figure 1. Fruit of EM1746

EM1764, released as **Malling™ Centenary** (early-mid season June-bearer)

EM1764 had a similar 50% harvest date to 'Elsanta' in the 2008 maincrop and 2009/10 60-day trials. In 2010 and 2011 maincrop trials it was slightly earlier than 'Elsanta'. The outstanding attribute of EM1764 is its excellent fruit quality. Berries are firm and attractive with very regular shape and excellent flavour. Good fruit size (average 76% large) and percentage Class 1 (average 93%) across all trials. Brix and shelf life are similar to 'Elsanta', with the exception that berries can sometimes appear darker, although glossiness is judged to be better. Maincrop yield is lower than for 'Elsanta' but EM1764 has a higher percentage of both Class 1 fruit and large (>35mm) berry size.

Plants of EM1764 have similar vigour to 'Elsanta', but with bigger leaves and the fruit is better displayed. Preliminary tests at EMR suggest that EM1764 does not have strong resistance to any diseases.

EM1764 was also trialled in substrate in 2011 and 2012 as part of HDC project SF 128 (Troop 2001, 2012a, 2012b), where it gave an excellent performance in terms of yield and fruit quality.

EM1764 was fast-tracked to commercialisation in 2010 and **released as Malling™ Centenary in 2013**.

Figure 2. Fruit of 'Malling™ Centenary' (EM1764)

EM1974 (mid-season June-bearer)

EM1974 was tested in the EMR maincrop trials in 2010 and 2012. It out-yielded 'Elsanta' on both occasions and gave a higher percentage of Class 1 fruit (Table 6.b.). Fruit size (% >35 mm) was lower in 2012 (52 %) than in 2010 (62 %) which was probably attributable to the poor growing season in 2012. Berries were glossy and attractive with a uniform shape (Figure 3). However the skin colour of EM1974 darkened slightly during shelf life tests, although it was still rated superior to 'Elsanta' in both years. Sensory flavour was judged to be consistently good in both trials at EMR. Plants were tall, with big leaves, but with a fairly open habit and good fruit display. EM1974 was also tested in the 60-day trials at EMR in 2011, where it gave a satisfactory yield (248g/plant) from relatively small plants (Table 7).

EM1974 has progressed to **large-scale growers' trials in 2015 and 2016**.

Figure 3. Fruit of EM1974

EM1977 (early-mid season June-bearer)

This selection was one of the highest yielding selections in the 2012 trial yielding 1.7kg/plant (Table 6.a.) with 78% Class 1fruit (comparable to 'Sonata') but only a low percentage (49%) of large (>35mm) berries. It had a slightly earlier season than 'Elsanta' (4 days) in 2012. Fruit was firm with good Brix scores which were reflected in the sensory flavour scores. Berries were attractive with a regular shape (Figure 4), however the skin colour of fruit was slightly darker than 'Elsanta', although shelf life scores were better. Plants had a slightly denser habit than 'Elsanta' but were healthy, with no mildew. EM1977 had also been trialled in 2010 when overall performance was similar but fruit size was better (60% large).

EM1977 has progressed to **preliminary growers' trials in 2014 and 2015.**

Figure 4. Fruit of EM1977

EM1990 (midseason June-bearer)

EM1990 was trialled as a maincrop selection in both 2010 and 2012 at EMR. There was some variation in yield between the two years but the Class 1 yield was comparable to 'Elsanta' in both (Table 6.b.). The percentage of Class 1 fruit from both trials was very high (96 % and 95 % respectively) with very good fruit size on both occasions (76 % and 79 % respectively). EM1990's season of production was slightly later than 'Elsanta' in 2010 and two days earlier in 2012 (Table 6.b.). Berries were very attractive and glossy with a regular shape and a good colour (Figure 5). Flesh firmness was also good. Fruit had a pleasant 'peachy' flavour and high Brix scores.

EM1990 gave a disappointing yield in the 2011 EMR 60-day trials, yielding 166g/plant (Table 7), although this may have been attributable to the small crown diameters of these plants (mean of 9.7mm).

EM1990 has progressed to **large-scale growers' trials in 2015 and 2016**.

Figure 5. Fruit of EM1990

EM1996 (mid-late season June-bearer)

EM1996 has a similar season to 'Symphony', being approximately 4 days later that 'Elsanta'. Berries are very attractive with a good gloss, shape and colour. Flavour scores and Brix levels have been similar to 'Elsanta' (Table 6.b.), but shelf-life has been superior. This is a high-yielding selection (1.6kg/plant in 2010 EMR trials) with good fruit size (62% >35mm in 2010) that has also performed well in both 60-day and maincrop trials on growers' sites. Plants have moderate vigour with an open habit and have a very good fruit display (Figure 6). Based on preliminary tests at EMR, EM1996 shows moderate resistance to crown rot, but some susceptibility to both Verticillium wilt and powdery mildew.

EM1996 has progressed to **large-scale growers' trials in 2014 and 2015**.

Figure 6. EM1996 growing in substrate on a growers' site in 2012

EM1998 (mid-late season June-bearer)

This selection had a slightly later season than 'Elsanta' when it was trialled at EMR in 2011, with a season nearer to 'Fenella'. Although it yielded 12% lower than 'Elsanta' it still gave a respectable Class 1 yield of 1.5kg/plant, with a higher % Class 1 (87%) and slightly better fruit size (68%) (Table 6.a.). Berries were attractive, with a regular-shape (Figure 7) and with slightly better shelf-life scores than 'Elsanta' (Table 6.a.). Average Brix was 8.7°, with fruit being given a mean sensory flavour score similar to 'Elsanta'. Plants were taller than 'Elsanta', due to a very erect habit but had a similar density. In 60-day trials at EMR in 2012, EM1998 had a similar yield to 'Elsanta' (Table 7).

EM1998 has progressed to **preliminary growers' trials in 2013 and 2014**.

Figure 7. EM1998 harvested from EMR trial (2011)

EM2044 (mid-late season June-bearer)

The 50% harvest date for EM2044 was 3 days later than 'Elsanta' when it was trialled in 2011. It yielded 1.5kg/plant, which was slightly lower than 'Elsanta' (Table 6.a.) but with slightly better fruit size. Berries had a regular shape and were attractive and firm with good gloss and colour (Figure 8). Flavour and Brix was judged to be similar to 'Elsanta'. Shelf life scores were excellent. Plant habit was similar to 'Elsanta' with moderate vigour. EM2044 was the highest yielding selection in the 2012 EMR 60-day trial producing 202g of marketable fruit per plant (Table 7).

EM2044 has progressed to **preliminary growers' trials in 2013 and 2014.**

Figure 8. Fruit of EM2044 harvested from the EMR trial (2014)

EM2056 (mid-late season June-bearer)

EM2056 was the highest yielding selection in the 2011 EMR maincrop trial (Class 1, 1.9kg/plant). It also had >90% Class 1 fruit and excellent fruit size (Table 6.a.). It cropped slightly later than 'Elsanta' with a similar season 'Fenella'. Berries were firm, with a glossy and attractive appearance with a good shape and colour (Figure 9). Flavour was acceptable but sometimes described as "weak" which is reflected in the low Brix scores. Plants were vigorous with a dense habit, similar to 'Florence'. The 60-day yield of EM2056 in the 2012 EMR 60-day trial was disappointing with only 126g/plant of marketable fruit produced, although the average Brix score was very high (10.7°) (Table 7).

EM2056 has progressed to **preliminary growers' trials in 2013 and 2014**.

Figure 9. Fruit of EM2056, showing its glossy appearance and uniform shape

EM2131 (mid-late season June-bearer)

This selection was one of the highest yielding selections in the 2012 trial (Class 1, 1.6kg/plant) with excellent fruit size and 85% of the fruit being graded as Class 1 (Table 6.a.). Fruit production from EM2131 was a few days later than 'Elsanta'. Berries were firm and glossy with good shape and colour (Figure 10), and with a shelf life similar to 'Elsanta'. Good scores were given for sensory flavour despite the relatively low average Brix scores. Some waste was due to mildew on later harvests, but otherwise there were no noted disease problems. Plants were slightly denser than 'Elsanta', but suitable for production under tunnels, with well displayed fruit. Overall, EM2131 was considered to be one of the best selections in the 2012 trial.

EM2131 has progressed to **preliminary growers' trials in 2014 and 2015**.

Figure 10. Fruit of EM2131 from the 2012 EMR maincrop trial.

EM2135 (midseason June-bearer)

With a similar season to 'Elsanta', EM2135 gave a good yield (1.2kg/plant) from a compact plant with sparse foliage that would make it well suited to high density planting or table-top production. It had also had good fruit size and 85 % Class 1 fruit (Table 6.a.). Fruit was very well displayed on the plants and there were no symptoms of mildew on either the leaves or the fruit. The berries were very firm and attractive (figure 11), although some primaries had irregular shapes. Shelf life results were inconsistent but on average gave a score similar to 'Elsanta'. Mean Brix scores were also similar to 'Elsanta' but the flavour was often watery.

EM2135 has progressed to **preliminary growers' trials in 2014 and 2015**.

Figure 11. Fruit of EM2135

EM2156 (late season June-bearer)

EM2156 was the highest yielding selection in the EMR 2012 maincrop trial (1.7g/plant) with a % Class 1 of 77 % (Table 6.a.). However, only 49% of the fruit was graded as large fruit (>35mm) with wasted being mainly confined to rots. It had a late season of production, being seven days later than 'Elsanta'. The berries were attractive and glossy with good shape (Figure 12) but sometimes suffered from uneven ripening. Firmness was variable but shelf life slightly better than 'Elsanta'. Brix and flavour scores were variable with an average Brix score slightly lower than 'Elsanta'. Plants were tall and fairly dense but with an erect habit and with a good fruit display.

EM2156 has progressed to **preliminary growers' trials in 2014 and 2015**.

EM2161 (early-midseason June-bearer)

An early-midseason selection, with a 50% harvest date 4 days ahead of 'Elsanta' but not as early as 'Clery' or 'Vibrant'. EM2161 had a high yield (1.4kg/plant) and good fruit size (74% >35mm) and 88% Class 1 fruit (Table 6.a.). Berries were glossy with a regular shape but a skin colour that was slightly darker than 'Elsanta' (Figure 12) and with some uneven ripening. Skin and flesh firmness was good and shelf life scores were better than for 'Elsanta' apart from darker skin colour. Brix scores were variable but the fruit was judged to have a good sugar:acid balance which is reflected in the Brix scores (Table 6.a.). Plants were tall with big leaves and possibly a bit too vigorous for tunnels. No mildew symptoms were observed.

EM2161 has progressed to **preliminary growers' trials in 2014 and 2015**.

Figure 12. Fruit of EM2161

EM2170 (early-midseason June-bearer)

EM2170 had a slightly earlier season than 'Elsanta' when it was trialled at EMR in 2012, but not as early as 'Clery' and 'Vibrant'. Berries were firm and glossy with regular shape but with a darker skin colour than 'Elsanta' (Figure 13) which marked it down on shelf-life tests. The mean Brix and sensory flavour scores were similar to 'Elsanta'. Class 1 yield, percentage Class 1 and percentage of large fruit (>35mm) were superior to 'Elsanta' (Table 6.a.). Plants were slightly denser than 'Elsanta'.

EM2170 has progressed to **preliminary growers' trials in 2014 and 2015**.

Figure 13. Fruit of EM2170

F62, released as **'Serenity'** (late season June-bearer)

F62 is a somaclonal variant of the popular late-season variety 'Florence' that was developed at EMR (Whitehouse, 2012; Simpson, 2013). It was trialled at EMR in 2010 (Table 6.c.). Its main feature is a light skin colour, which is bright orange/red and measures two points paler on the CTIFL colour chart compared to 'Florence' (Figure 14). The average fruit size and percentage of Class 1 fruit is similar to both 'Florence' and 'Elsanta' (Table 6.c.). 'Serenity' has shown good yield potential in maincrop production, yielding 1.3kg/plant of Class 1 fruit in the 2009 EMR trial. Berries are firm and juicy, with a pleasant flavour and Brix levels similar to both 'Elsanta' and 'Florence' in EMR trials. The plants of 'Serenity' are less vigorous and less dense than 'Florence', and have a good fruit display. Like 'Florence', 'Serenity' shows a high level of resistance to crown rot, Verticillium wilt and powdery mildew.

F62 was fast-tracked to commercialisation in 2010 and **released as 'Serenity' in 2012**.

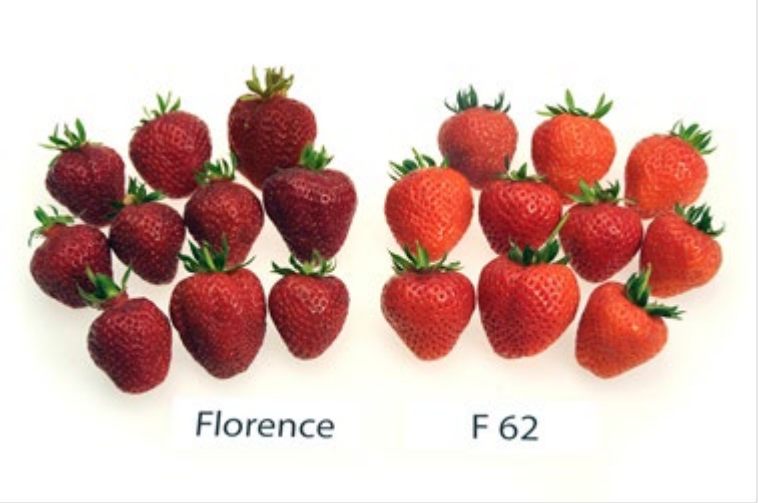

Figure 14. Comparison of fruit of 'Florence' (left) and 'Serenity' (F62) (right) demonstrating the difference in skin colour

Everbearer trial

Fourteen selections in total were identified for progression to growers' trials following the results of the preliminary EMR trials. However seven of these advanced selections (EMR314, EMR436, EMR474, EMR477, EMR518, EMR521 and EMR562) were subsequently deselected by the Club Board as they were found to be susceptible to either crown rot, Verticillium wilt, powdery mildew, white streak or have a combination of these diseases. Four advanced selections (EMR506, EMR564, EMR569, EMR590) are currently in the process of being propagated for preliminary growers' trials in 2014, with another (EMR489) progressing to large-scale growers' trials in 2014. A further two selections (EMR428 and EMR470) were selected for fast tracking and commercialisation due to their excellent fruit quality. EMR428 has subsequently (2012) been released as 'Buddy' and is being commercialised by Hargreaves Plants Ltd, while EMR470 is undergoing commercial-scale trials and is being commercialised by Meiosis Ltd. The current status of all the advanced selections that were identified between 2008 and 2013 (Table 5), along with descriptions of those selections that remain in trial or have been released, are shown below:

Table 5. The current status of advanced everbearer selections that were identified and trialled between 2008 and 2013. Descriptions of those shown in **BOLD** appear below the table.

Selection	Year in trial		Current status
	EMR[1]	Growers'	
EMR314	2009/11	2011	Rejected 2011 following growers' maincrop trial
EMR428	2008-11	2011	Commercialised and released as 'Buddy'
EMR436	2008-10	2010	Rejected 2010 following growers' maincrop trial
EMR470	2009/11	2011	Undergoing commercial trials
EMR474	2009/11	2011	Rejected 2011 following growers' maincrop trial
EMR477	2009/11	2011	Rejected 2011 following growers' maincrop trial
EMR489	2010-11/13	2012	Progressed to large-scale growers' trials in 2014
EMR518	2010/12	2012	Rejected 2012 following growers' maincrop trial
EMR521	2011/13	2013	Rejected 2013 following growers' maincrop trial
EMR562	2011/13	2013	Rejected 2013 following growers' maincrop trial
EMR506	2012	2014	Progressed to preliminary growers' trials in 2014
EMR564	2012	2014	Progressed to preliminary growers' trials in 2014
EMR569	2012	2014	Progressed to preliminary growers' trials in 2014
EMR590	2012	2014	Progressed to preliminary growers' trials in 2014

[1]Including recycled

A description of each of the current advanced or advanced selections follows (in alphanumeric order):

EMR428 (everbearer), released as **'Buddy'**

EMR has been trialled at EMR in 2008, 2009, 2010 and 2011 (Table 8.c.). 'Buddy' has excellent fruit quality, with firm, attractive, glossy berries that have a good shape and colour (Figure 15). Eating quality is excellent with a good balance of sugar and acid and high Brix levels. Shelf life is good, and superior to 'Evie 2'. Yield is moderate, producing 976g per plant with a good percentage of large fruit (65%). Plants have moderate vigour and runner production. EMR428 appears to show a useful level of resistance to crown rot based on trials at EMR.

EMR428, was fast-tracked to commercialisation in 2010 and **released as 'Buddy'** in 2012.

Figure 15. Fruit (left) and fruiting plant (right) of 'Buddy' (EMR428)

EMR470 (early season everbearer)

EMR470 was trialled at EMR in 2009 and 2011. It is an early-season everbearer with an excellent flavour that was found to be consistently sweet throughout the season. It had a high percentage of Class 1 fruit (85%) and good yield potential, averaging 1.3 kg/plant. Berries are firm and glossy with a good regular shape, although fruit can be slightly darker colour than 'Evie 2' (Figure 16). The plants have moderate vigour, with good fruit display and show a useful level of resistance to powdery mildew. EMR470 scored well in shelf life tests in 2011 and Brix levels have been consistently higher than standards with an average of 9.5° from all EMR trials. Runner production is good.

EMR470 has been fast-tracked for commercialization with **commercial-scale trials on growers' farms taking place in 2014**.

Figure 16. Fruit (left) and fruiting plant (right) of EMR470

EMR489 (early-season everbearer)

An early season everbearer, with the majority of production in July and the first half of August in trials at EMR. Fruit is firm, with glossy, good-shaped berries and with good flavour and Brix scores (average of 8.7° in EMR trials). It has a moderate fruit size (51% >35 mm) and a yield of >1kg/plant based on trials at EMR and on growers' sites. Plants have moderate vigour with good fruit display and moderate runner production and show intermediate resistance to both Verticillium wilt and crown rot based on screening at EMR.

EMR489 is currently in propagation for **large-scale grower trials** to be carried out in **2014**.

Figure 17. Fruiting plants (left) and fruit (right) of EMR489

EMR506

This selection had originally be trialled in 2010 when it given a high yield (1.6kg/plant) and very high Class 1 (94%). It was trialled again at EMR in 2012 when it proved to be productive and the berries were considered to be attractive with a good shape and colour (Figure 18). Skin strength was good but flesh was often noted as soft during sensory testing, although shelf life was good. Flavour was variable, sometimes sweet, sometimes watery, but average Brix was good (Table 8.a.). Percentage waste was below average for the trial and mostly due to slugs, but with no mildew seen on the fruit. Cropping peaked in the second half of August but then declined very rapidly through September.

EMR506 is progressing to **preliminary growers' trials in 2014**.

Figure 18. Fruit of EMR506

EMR564 (early season everbearer)

EMR564 was trialled at EMR in 2012 where it gave a Class 1 yield of just under 1kg/plant which was higher than the standard 'Evie 2' (Table 8.a.). It gave a low percentage waste (68% Class 1 fruit) and had good fruit size (>35mm, average 68%). Berries were very attractive (Figure 19) with firm skin and flesh and very good shelf life. The texture of the fruit was found to be slightly dense and flavour was quite variable, sometimes being described as "weak". However, average Brix scores were good (8.9°). Very little mildew was seen on the fruit and the plants appeared healthy. EMR564 had an early season, with very good production throughout July 2012.

EMR564 is progressing to **preliminary growers' trials in 2014**.

Figure 19. Fruit of EMR564

EMR569 (early season everbearer)

EMR569 was trialled in 2012 and gave a relatively good yield for that trial year (883g/plant), with good fruit size (64% > 35 mm). Berries were firm and glossy, with good colour (Figure 20) but shape could be slightly irregular on some picks. Flavour was mostly good with high average Brix (9.1°). Shelf life was better than the standard 'Evie 2'. EMR569 has an early season of production, being most productive in July and August and tailing off very abruptly in September. Some mildew was seen on the fruit from mid-August in what was a challenging year for the disease, but no other disease problems were encountered.

EMR569 is progressing to **preliminary growers' trials in 2014**.

Figure 20. Berries of EMR569

EMR590 (everbearer)

EMR590 had very good fruit quality scores in the 2012 EMR everbearer trial, scoring well for sensory flavour which was often sweet, with good Brix scores. The Class 1 yield was good for the trial year and 81% of production was Class 1 (Table 8.a.). Berries were attractive and glossy with regular shape and good firmness (Figure 21). Shelf life was only tested twice but rated as acceptable. The seasonal cropping pattern was very similar to the standard 'Evie 2'. Some mildew was seen on the fruit later in the season.

EMR590 is progressing to **preliminary growers' trials in 2014**.

Figure 21. Berries of EMR590

Table 6(a). EMR June-bearer maincrop trials data for selections that have progressed to preliminary growers' trials

Year	Selection	Class 1 yield (g/plant)	% Class 1	% large fruit (>35mm)	Appearance	Skin firm	Flesh firm	Flavour	Shelf life score (1-9)	Mean Brix	50% pick date	Vigour (1-9)	Density (1-5)	Display (1-3)
2011	EM1998	1518	87	68	6.3	5.8	5.9	5.4	5.9	8.7	13 Jun	7	3	3
	EM2044	1585	88	68	6.3	6.8	6.3	5.2	7.5	8.3	13 Jun	6	3	2
	EM2056	1934	91	77	5.6	5.9	5.8	5.2	-	6.5	13 Jun	7	4	2
	Elsanta[1]	*1735*	*84*	*64*	*4.9*	*6.1*	*5.4*	*5.1*	*5.3*	*8.0*	*10 Jun*	*6*	*3*	*3*
2012	EM1977	1686	78	49	4.7	5.8	6.2	6.0	4.8	8.8	21 Jun	6	4	3
	EM2131	1626	85	66	6.2	5.9	6.6	5.8	4.3	7.6	28 Jun	6	4	3
	EM2135	1213	85	63	5.5	6.7	7.3	4.9	3.5	8.4	25 Jun	4	3	3
	EM2156	1740	77	49	5.8	5.9	5.5	5.0	4.0	8.1	2 Jul	6	4	3
	EM2161	1482	88	74	5.7	5.9	5.8	5.9	5.0	8.4	21 Jun	7	3	2
	EM2170	1456	78	63	5.6	6.6	6.0	5.4	4.3	8.8	21 Jun	6	4	2
	Elsanta[1]	*1062*	*60*	*50*	*4.4*	*6.1*	*5.3*	*5.2*	*3.7*	*8.4*	*25 Jun*	*6*	*3*	*3*

[1]Mean of three plots

The key to fruit and plant characteristics scores are shown in Appendix I

Table 6(b). EMR June-bearer maincrop trials data for selections that have progressed to large-scale growers' trials

Year	Selection	Class 1 yield (g/plant)	% Class 1	% large fruit (>35mm)	Appearance	Skin firm	Flesh firm	Flavour	Shelf life score (1-9)	Mean Brix	50% pick date	Vigour (1-9)	Density (1-5)	Display (1-3)
2008	EM1746	718	92	57	6.6	6.7	7.3	6.2	4.6	8.6	23 Jun	5	4	3
	Elsanta[1]	*801*	*81*	*49*	*5.2*	*6.2*	*6.2*	*5.8*	*3.0*	*8.5*	*16 Jun*	*6*	*3*	*3*
2010	EM1746	876	89	66	6.4	6.4	6.5	5.5	4.5	8.3	24 Jun	5	3	3
	EM1974	1001	93	62	6.4	6.2	6.4	5.9	6.0	8.2	21 Jun	7	3	3
	EM1990	1074	96	76	6.7	5.7	6.6	5.7	6.1	9.5	28 Jun	6	3	3
	EM1996	1589	91	62	5.9	5.6	6.0	5.4	5.7	8.9	28 Jun	6	3	1
	Elsanta[1]	*922*	*80*	*52*	*5.1*	*6.0*	*5.8*	*5.4*	*4.5*	*9.4*	*24 Jun*	*5*	*3*	*3*
2012	EM1974[1]	1231	84	52	5.9	6.2	6.0	5.8	5.0	8.4	21 Jun	7	3	3
	EM1990[1]	933	95	79	6.7	6.4	6.0	5.7	5.3	9.1	23 Jun	7	3	3
	EM1996[1]	1255	58	79	5.9	5.9	6.2	4.8	4.2	7.4	26 Jun	7	3	3
	Elsanta[2]	*1062*	*60*	*50*	*4.4*	*6.1*	*5.3*	*5.2*	*3.7*	*8.4*	*25 Jun*	*6*	*3*	*3*

[1]Mean of two plots, [2]Mean of three plots

The key to fruit and plant characteristics scores are shown in Appendix I

Table 6(c). EMR June-bearer maincrop trials data for selections that have progressed to commercialisation

Year	Selection	Class 1 yield (g/plant)	Class 1 (%)	% large fruit (>35mm)	Appearance	Skin firm	Flesh firm	Flavour	Shelf life score (1-9)	Mean Brix	50% pick date	Vigour (1-9)	Density (1-5)	Display (1-3)
2008	EM1764[3]	383	93	77	6.6	6.6	6.7	7.2	-	9.1	16 Jun	6	3	3
	Elsanta[2]	665	77	49	5.1	6.3	6	5.9	-	9.2	17 Jun	6	3	3
2009	EM1764[3]	936	94	81	7.0	6.5	6.3	6.0	5.7	8.7	11 Jun	6	3	3
	Elsanta[2]	1223	80	62	5.4	6.0	5.8	5.4	4.2	9.0	15 Jun	6	3	3
	F62[4]	1271	84	57	5.0	5.6	5.8	5.0	4.7	8.0	22 Jun	7	4	2
	Florence[1]	*824*	*77*	*61*	*4.0*	*5.5*	*5.6*	*5.1*	*3.5*	*8.5*	*18 Jun*	*7*	*4*	*2*
2010	EM1764[1,3]	699	93	74	6.4	6.2	6.3	6.6	5.0	9.4	21 Jun	6	3	3
	Elsanta[2]	*922*	*80*	*52*	*5.1*	*6.0*	*5.8*	*5.4*	*4.5*	*9.4*	*24 Jun*	*5*	*3*	*3*
	F62[4]	1040	81	57	4.7	5.3	5.5	5.5	5.0	9.3	1 Jul	7	4	2
	Florence[1]	*1280*	*87*	*58*	*4.5*	*6.1*	*6.1*	*5.6*	*4.0*	*9.1*	*28 Jun*	*7*	*4*	*2*
2011	EM1764[1,3]	1313	95	78	6.7	6.7	6.5	6.3	6.2	8.1	4 Jun	6	3	3
	Elsanta[1]	*1735*	*84*	*64*	*4.9*	*6.1*	*5.4*	*5.1*	*5.3*	*8.0*	*10 Jun*	*6*	*3*	*3*
2012	EM1764[1,3]	1094	90	64	6.3	6.6	6.6	5.8	4.6	7.7	18 Jun	6	3	3
	Elsanta[2]	*1062*	*60*	*50*	*4.4*	*6.1*	*5.3*	*5.2*	*3.7*	*8.4*	*25 Jun*	*6*	*3*	*3*

[1]Mean of two plots, [2]Mean of three plots, [3]Released as 'Malling™ Centenary', [4] Released as 'Serenity'

The key to fruit and plant characteristics scores are shown in Appendix I

Table 7. EMR June-bearer 60-day trials data for selections that have progressed to growers' trials and commercialisation

Year	Selection	Marketable yield[1] (g/plant)	Unmarketable[2] yield (g/plant)	% marketable yield	Mean crown diameter (mm)	Marketable (g/plant) yield per mm crown diameter	50% pick date	Mean Brix
2009	EM1746	235	5	89	10.3	22.8	20 Jul	10.7
	EM1764[4]	164	3	96	9.7	16.9	13 Jul	10.2
	Elsanta[3]	*180*	*18*	*81*	*9.1*	*19.8*	*13 Jul*	*9.9*
2010	EM1764[4]	208	11	95	10.9	19.1	12 Jul	8.8
	F62[3,5]	102	41	71	9.6	10.7	17 Jul	8.4
	Elsanta[3]	*282*	*38*	*88*	*11.5*	*24.5*	*12 Jul*	*8.5*
	Florence[3]	*172*	*35*	*83*	*9.7*	*18.0*	*17 Jul*	*8.5*
2011	EM1974	248	29	90	10.5	23.5	21 Jul	8.8
	EM1990	166	7	96	9.5	17.4	28 Jul	8.7
	EM1996	231	32	88	9.7	23.8	28 Jul	8.8
	Elsanta[3]	*322*	*41*	*89*	*13.0*	*24.7*	*23 Jul*	*9.1*
	Sonata	*290*	*70*	*81*	*8.8*	*33.0*	*25 Jul*	*9.0*
2012	EM1998	143	41	78	10.6	13.5	26 Jul	9.9
	EM2044	202	32	86	10.0	20.2	26 Jul	8.6
	EM2056	126	20	86	11.9	10.6	19 Jul	10.7
	Elsanta[3]	*137*	*43*	*74*	*11.9*	*11.5*	*23 Jul*	*8.9*
	Sonata	*144*	*21*	*87*	*10.4*	*13.9*	*26 Jul*	*9.3*

[1] >25 mm, [2] < 25mm & waste, [3] mean of two plots, [4] Released as 'Malling™ Centenary', [5]Released as 'Serenity'

The key to fruit and plant characteristics scores are shown in Appendix I

Table 8(a). EMR Everbearer trials data for selections that have progressed to preliminary growers' trials

Selection	Class 1 yield (g/plant)	Class 1 (%)	% large fruit (>35mm)	Appearance	Skin firm	Flesh firm	Flavour	Shelf life score (1-9)	Mean Brix	50% pick date	Vigour (1-9)	Density (1-5)	Display (1-3)
EMR506	1044	79	51	6.0	6.2	5.2	5.3	4.4	8.9	20 Aug	5	3	2
EMR564	975	88	58	5.9	6.9	7.1	5.2	5.7	8.9	2 Aug	4	2	3
EMR569	883	70	64	5.6	5.7	6.1	5.4	4.5	9.1	6 Aug	5	3	3
EMR590	907	81	53	5.6	6.6	6.9	5.6	4.0	8.9	20 Aug	6	3	2
Evie 2	*762*	*77*	*64*	*5.7*	*5.5*	*5.9*	*4.9*	*2.6*	*8.0*	*13 Aug*	*7*	*4*	*3*

The key to fruit and plant characteristics scores are shown in Appendix I

Table 8(b). EMR Everbearer trials data for selections that have progressed to large-scale growers' trials

Year	Selection	Class 1 yield (g/plant)	Class 1 (%)	% large fruit (>35mm)	Appearance	Skin firm	Flesh firm	Flavour	Shelf life score (1-9)	Mean Brix	50% pick date	Vigour (1-9)	Density (1-5)	Display (1-3)
2010	EMR489	1058	86	51	5.5	6.2	6.3	5.6	4.4	8.7	2 Aug	5	3	3
	Evie 2[1]	*848*	*89*	*55*	*5.7*	*5.8*	*5.8*	*5.1*	*-*	*7.6*	*6 Aug*	*6*	*4*	*3*
2011	EMR489	1158	78	72	5.3	6.1	6.1	6.1	4.4	7.8	4 Aug	5	3	3
	Evie 2[1]	*1569*	*76*	*79*	*5.4*	*5.5*	*5.9*	*4.7*	*4.1*	*5.7*	*18 Aug*	*7*	*4*	*3*

[1]Mean of two plots
The key to fruit and plant characteristics scores are shown in Appendix I

Table 8(c). EMR Everbearer trials data for selections that have progressed to commercialisation

Year	Selection	Class 1 yield (g/plant)	Class 1 (%)	% large fruit (>35mm)	Appearance	Skin firm	Flesh firm	Flavour	Shelf life score (1-9)	Mean Brix	50% pick date	Vigour (1-9)	Density (1-5)	Display (1-3)
2008	EMR428[2]	732	93	65	5.8	6.4	6.8	6.1	4.0	9.2	4 Aug	4	3	3
	Everest[1]	*1528*	*85*	*54*	*5.0*	*6.1*	*6.3*	*4.8*	*4.0*	*7.5*	*7 Aug*	*5*	*4*	*3*
2009	EMR428[1,2]	849	86	61	6.0	6.7	7.1	6.2	5.0	9.3	14 Aug	6	3	3
	EMR470	1551	87	46	6.1	6.2	6.6	6.3	4.4	10.3	6 Aug	6	4	3
	Evie2[1]	*1072*	*64*	*57*	*5.6*	*5.6*	*6.0*	*4.9*	*4.3*	*7.9*	*9 Aug*	*7*	*4*	*2*
2010	EMR428[2]	967	93	64	5.8	6.6	7.0	5.9	4.0	9.7	2 Aug	6	4	3
	Evie 2[1]	*848*	*89*	*55*	*5.7*	*5.8*	*5.8*	*5.1*	*-*	*7.6*	*6 Aug*	*6*	*4*	*3*
2011	EMR428[1,2]	976	85	65	5.8	6.4	6.5	5.9	5.0	7.9	10 Aug	6	3	3
	EMR470[1]	1261	85	61	5.7	6.0	6.2	6.2	5.7	8.7	8 Aug	5	3	3
	Evie 2[1]	*1569*	*76*	*79*	*5.4*	*5.5*	*5.9*	*4.7*	*4.1*	*5.7*	*18 Aug*	*7*	*4*	*3*

[1]Mean of two plots, [2]Released as 'Buddy'
The key to fruit and plant characteristics scores are shown in Appendix I

Conclusions

During the period covered by this report 862 crosses were performed, 73,538 seedlings were assessed and 641 selections made. A total of 652 new selections were assessed in preliminary trials at EMR with 48 selections progressing to preliminary growers' trials. Of these, 24 (50%) are progressing or remain within the trialling system: four have progressed to commercialisation, five have progressed to large-scale growers' trials and 15 (11 June-bearers and four everbearers) are currently, or waiting to be assessed in preliminary growers' trials. A summary of the current status of advanced selections is shown below:

June-bearers

- Nine selections will be assessed in preliminary growers' trials in:

  2013/14 EM1998, EM2044, EM2056,

  2014/15 EM1977, EM2131, EM2135, EM2156, EM2161, EM2170

- Four advanced selections will be assessed in large-scale growers' trials in:

  2013/14 EM1746

  2014/15 EM1996

  2015/16 EM1974, EM1990

- Two advanced selections have been commercialised and released:

  EM1764 released in 2013 as 'Malling™ Centenary'

  F62 released in 2012 as 'Serenity'

Everbearers

- Four selections will be assessed in preliminary growers' trials in 2014:

  EMR506, EMR564, EMR569, EMR590

- One advanced selections, EMR489, has progressed to large-scale growers' trials in 2014.

- One advanced selection, EMR470, is being fast-tracked for commercialisation and is undergoing commercial trials in 2013/14.

- One advanced selection, EMR428, was commercialised and released in 2012 as 'Buddy'.

The breeding programme will continue to develop elite strawberry selections and varieties via a second tranche of funding for the EMSBC that will run from 2013 until 2023 (with a break clause in 2018) and will benefit in the near future from the use of molecular markers for disease resistance (developed from allied EMR research programmes) which enable a marker assisted approach to the breeding work.

Technology Transfer

- A joint HDC/EMRA evening fruit walk was held in June of every year during the project which allowed HDC members to sample both new and advanced June-bearer selections from the EMSBC programme. Members were also given the opportunity to discuss the programme with David Simpson (Head breeder), Adam Whitehouse (Project manager) and Abi Johnson (Trials manager). These walks were generally very well-attended with excellent feedback received from attendees.
- The EMSBC shared a stand with the HDC at Fruit Focus in July 2010, 2011 and 2012. Samples of both the advanced and the released varieties were displayed and attendees were also given the opportunity to visit demonstration plots of the new EMSBC varieties 'Buddy' (EMR428) and 'Malling Centenary' in 2011 and 2012 respectively.
- Details of EMSBC programme and advanced selections were presented at four HDC/EMRA Soft Fruit Days in November 2008, 2009, 2010, 2011 and 2012.
- Two presentations relating the EMSBC strawberry breeding programme were presented at the VII International Strawberry Symposium, Beijing, China in February 2012.
- Posters detailing the EMSBC and varieties and advanced selections were presented at the BerryGardens Growers Ltd conference in November 2010, 2011 and 2012.

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Appendix

Scoring system employed for fruit and plant characteristics

Fruit characteristics:

Appearance	3=poor 5=acceptable 7=attractive
Skin Firmness	3=weak 5=acceptable 7=tough
Flesh Firmness	3=soft 5=acceptable 7=firm
Flavour	1=unpleasant 3=poor 5=acceptable 7=pleasant 9=very pleasant

Shelf life:

Overall Score	1=Very unattractive 3=Unattractive 5=Shape or colour may be uneven, there may be a few bruises 7=Even shape and colour 9=Attractive, looks fresh

Plant characteristics:

Plant Vigour	1=weak 5=intermediate 9=excessive
Plant Density	1=open 3=intermediate 5=dense
Fruit Display	1=poor 2=intermediate 3=good