Project title:	East Malling Strawberry Breeding Club
Project number:	SF 96a
Project leader:	Adam Whitehouse, NIAB EMR
Report:	Annual report, May 2022
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Key staff:	Adam Whitehouse Katie Hopson Abi Johnson Andy Passey
Location of project:	NIAB EMR
Industry Representative:	Nathalie Key
Date project commenced:	1 June 2013
Date project completed (or expected completion date):	31 May 2023

The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

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.

Adam Whitehouse

Programme Leader (Plant Breeder)

NIAB EMR

Signature  Date 31st May 2022

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GROWER SUMMARY

Headline

Six new selections; four June-bearers and two everbearers were selected from the 2021 East Malling Strawberry Breeding (EMSBC) preliminary trials to go forward to UK growers' trials. Of the four June-bearers there were three mid-season and one mid-late season types. All these selections will be trialled on UK grower sites in 2023-24.

Background

The main objective of the East Malling Strawberry Breeding Club (EMSBC) is to develop and improved strawberry varieties, both June and everbearing with increased yield, larger fruit size, extended season of production and greater resistance to fungal diseases. Funding for the programme was renewed in 2013 to follow on from the first tranche of the EMSBC breeding programme which started in 2008 and that delivered the June-bearer variety Malling™ Centenary. AHDB continues to contribute to the EMSBC via project SF 96a. In 2017 it was agreed that AHDB would continue to remain a member of the EMSBC and continue funding the programme until May 2023.

This report covers two preliminary trials held at NIAB East Malling in 2021 that are part-funded by the AHDB membership of the EMSBC (June-bearer main crop and everbearer trials).

Results of selection trials

Descriptions and results from the most promising selections in each of the 2021 preliminary trials are shown below, accompanied with tables of results for each trial:

NIAB East Malling June-bearer trial

Four selections from the 2021 EMSBC trials showed sufficient potential to progress to small-scale growers' trials in 2023-24. A description of each selection appears below, listed in order of season (earliest to latest), with accompanying data show in Tables 1 and 2:

EM2903 is an early season selection with a high percentage of Class 1 fruit and large fruit size (65% >35mm), but only low-moderate yield. Fruit was attractive and sensory flavour was judged to be sweet on a number of assessments.

EM2910 is an early mid-season selection that was very similar in most respects to Malling™ Centenary but with a better crown rot predictive score (genotype) potentially indicating increased resistance.

EM2925 is a large-fruited, early midseason selection that gave a higher percentage of Class 1 (96%) and Large fruit (84% >35mm) when compared to Malling™ Centenary. Berries are bright, with a lighter skin colour than Malling™ Centenary.

EM2933 is a midseason selection with excellent fruit size (72% >35mm) and a yield similar to Malling™ Centenary. Berries were brighter and glossier in appearance than Malling™ Centenary and had excellent shelf-life scores.

Table 1. June-bearer selections: yield, fruit size and season

Selection	Class 1 yield (g/plant)	% Class 1	% large fruit (>35mm)	50% pick date
EM2903[1]	181	93	65	15 June
EM2910[1]	415	90	63	19 June
EM2925[1]	343	96	84	22 June
EM2933[1]	444	93	72	21 June
M. Centenary[2]	*435*	*93*	*59*	*20 June*

[1]Mean of two plots [2]Mean of eight plots

Table 2. June-bearer selections: mean fruit quality scores

Selection	Appearance (1-9)	Skin firmness (1-9)	Flesh firmness (1-9)	Flavour (1-9)	Shelf life (1-5)	Mean Brixº
EM2903[1]	5.7	6.0	6.1	5.7	4.0	7.4
EM2910[1]	5.5	5.2	5.6	5.4	2.9	8.2
EM2925[1]	5.8	6.0	5.8	5.3	3.0	8.4
EM2933[1]	5.5	5.9	6.1	5.3	3.7	8.4
M. Centenary[2]	*5.8*	*5.9*	*5.8*	*5.5*	*3.6*	*8.0*

[1]Mean of two plots [2]Mean of eight plots

Full descriptions of the fruit quality scoring system can be found in Appendix I of the main report, but as a guide 1=poor, 9=excellent, shelf life comparison 1=worse, 3=same,5 better than standard.

NIAB East Malling Everbearer trial

Two new selections progressed to small-scale growers' trials to be held assessed in 2023. Descriptions of these selections and associated trial data (Tables 3 & 4) are shown below:

EMR943 is a high-yielding selection (1022g per plant) with an excellent display of attractive berries and pleasant flavour with some complex notes.

EMR965 is a high yielding selection, with peak of production earlier in the season than Malling™ Ace. Good all round fruit characteristics, similar to Malling™ Ace, but with higher, white necks.

Table 3. Everbearer selections: yield, fruit size and season

Selection	Class 1 yield (g/plant)	% Class 1	% large fruit (>35mm)	50% pick date
EMR943[1]	1022	88	52	23 Aug
EMR965[1]	922	89	61	16 Aug
M. Ace[2]	*868*	*88*	*61*	*19 Aug*
M. Champion[3]	*606*	*66*	*26*	*13 Aug*
Murano[3]	*464*	*60*	*26*	*20 Aug*

[1]Mean of two plots [2]Mean of three plots [3]Mean of six plots

Table 4. Everbearer selections: fruit quality scores

Selection	Appearance (1-9)	Skin firmness (1-9)	Flesh firmness (1-9)	Flavour (1-9)	Shelf life (1-5)	Mean Brix^{o}
EMR943	5.8	5.9	5.9	5.2	3.4	7.7
EMR965	5.3	5.5	5.7	5.2	3.0	8.4
M. Ace[2]	*6.1*	*5.7*	*5.9*	*5.3*	*2.0*	*8.5*
M. Champion[3]	*5.4*	*6.3*	*6.5*	*5.1*	*2.6*	*7.8*
Murano[3]	*5.3*	*5.5*	*5.8*	*5.3*	*2.5*	*8.4*

[1]Mean of two plots [2]Mean of three plots [3]Mean of six plots

Full descriptions of the fruit quality scoring system can be found in Appendix I of the main report, but as a guide: 1=poor, 9=excellent, and for shelf life comparison: 1=worse, 3=same, 5 better than standard

Offsite main crop (June-bearer) growers' trial

Four advanced selections (EM2628, EM2696, EM2721 and EM2723) had been overwintered on growers' sites from the 60-day trials in 2020, and were assessed as maincrop (2nd year) in 2021. EM2723 was deemed to have performed sufficiently well to progress to large-scale trials in 2023. The remaining selections were rejected.

EM2723 is a mid-late season selection, with the bulk of production fitting between Malling™ Centenary and Malling™ Allure, with a pleasant flavour and high average Brixº (9.3º).

Offsite 60-day (June-bearer) growers' trial

Five selections had previously been selected (2019) for 60-day trialling in 2021 (EM2583, EM2625, EM2763, EM2770 and EM2797). Two selections, EM2770 and EM2797, performed sufficiently well in the 60-day growers' trials to be overwintered and will be trialled as main crop in 2022. The remaining selections were rejected.

EM2770 a mid-late season June-bearer, with large fruit size (average 26.1g), attractive fruit, good flavour and average Brix score of 8.9°.

EM2797 is a late season June-bearer, characterised by very attractive, glossy berries and excellent, consistently sweet flavour (average Brix of 10.3°).

Offsite everbearer growers' trial

Two advanced selections were trialled in small-scale growers' trials: EMR862 and EMR863, with one advanced selections in large-scale trials: EMR794. EMR794 and EMR863 performed well enough to go forward for large-scale trials in 2023. EMR862 was rejected.

EMR794 is a productive selection that is similar in main attributes to Malling™ Ace, having a high, average percentage of Class 1 fruit (93%), good fruit size (24.2g) and average of 761g of Class 1 fruit per plant (cf. 773g from Malling™ Ace). Berries are attractive, with a pleasant, juicy flavour and average Brix of 8.5°. EMR794 has moderate to intermediate resistance to crown rot, and intermediate resistance to powdery mildew.

EMR863 is a selection that produce sweet-flavoured berries, with an average Brix score of 9.3° across offsite trials. Preliminary disease tests and field observations indicate that EMR863 has moderate resistance to crown rot and powdery mildew.

SCIENCE SECTION

Introduction

This report covers two trials (June-bearer main crop and everbearer) as part of the 2021 preliminary trials assessed at NIAB East Malling on behalf of the East Malling Strawberry Breeding Club (EMSBC). The EMSBC was set up in 2008 to continue the national strawberry programme that has operated at EMR since 1983 with the AHDB contributing via project SF 96. A second tranche of the EMSBC was agreed in 2013 for a 10-year term (with a break clause after five years) and commenced on 1 June 2013. In 2017 the AHDB agreed to remain a member of the EMSBC and continue part funding the programme until 2023 via project SF 96a.

It is the intention of the breeding programme to release new varieties which show advantage over those currently available for a particular purpose or slot in the season. This advantage may be in terms of fruit quality, yield, resistance to diseases, fruit size and display (to reduce picking costs) and any combination of these characters.

In addition the programme is benefiting from associated research projects funded at NIAB East Malling that feed into the breeding work, primarily those associated with the development of a molecular genetics approach to disease resistance. The integration of basic science to benefit the programme has recently been demonstrated by the use of predictive scores for disease susceptibility based on genotyping of all selections and parental lines.

Trial Methods

Trials were performed at the Breeders' trial site (Churchfields East, East Malling, ME19 6BJ). Both trials were maintained on table tops under Haygrove Pioneer tunnels using an automatic irrigation system using Delta-T sensors. Agronomy, including fertigation and integrated pest management programmes were provided by an industry agronomist.

Fruit was harvested twice-weekly from each trial into individual trays that were assigned a unique alpha-numeric plot code (to avoid selection bias). Fruit was graded into five categories, primarily based on fruit size (diameter in mm): giant (>45 mm),

large (>35 mm), medium (>28 mm), small (<28 mm) and waste (fruit rendered unmarketable due to damage (physical and/or pathological), misshape or rots. Class 1, or marketable fruit, was classified as fruit >28 mm diameter, with unmarketable being defined as <28 mm diameter and waste fruit. Yield is presented as the mean of all plants in each individual plot.

Fruit quality (appearance, skin and flesh firmness and flavour) assessments were performed immediately after each pick, using the scoring system shown in Appendix I. Assessments were carried out by a panel of experienced breeders.

Post-harvest records of Brixº (soluble sugars) and shelf-life, were taken as often as possible throughout the season with a minimum of three records for each selection per season.

Brixº was measured using a sample of two berries per selection per pick that were halved longitudinally with the juice from each half-fruit being assessed using a digital refractometer. The mean score for each selection across the season are presented in the results section.

Shelf-life tests were performed on ten unblemished fruit that were sampled once a week for each selection during its fruiting season. Samples were collected at the fruit evaluation stage immediately after picking and were transferred in open, 454 g punnets to a +2 ºC cold-store for 24 h. After 24 h these samples were transferred to a controlled environment cabinet and maintained at 17 ºC at 70% RH for a further 72 h. An assessment of each sample was then performed via a comparative assessment against a standard cultivar using the scoring system shown in the Appendix 1. The mean scores for each selection across the season are presented in the results section.

NIAB East Malling June-bearer trial

The main crop trial contained 68 new selections, nine advanced and six standards, including Malling™ Centenary. Misted tips were struck on June 16th 2020 into 9-hole trays containing Legro standard tray plant mix, which were transferred to unheated, fully vented glass on 25th July 2020 for growing on. Plants were fertigated following a recommended industry feeding schedule provided by Berry Plants Ltd (EMSBC Trial plant propagator). Trays were moved to -2 C cold store (Berry Plants Ltd., Newchurch, Kent) when fully dormant on December 14th 2020, and were removed from the store

in March 2021 and planted into 1m white Botanicoir Precision coir bags (Botanicoir, London, UK) on 17th March 2021 at a density of 8 plants per linear metre. Plants were then fertigated for the remainder of the season following the recommendations of industry agronomist. First pick was on 7th June 2021 (with the first pick from Malling™ Centenary on 10th June 2021) and continued through until 26th July 2021.

NIAB East Malling Everbearer trial

The everbearer trial contained 27 new selections, plus standards (Malling™ Ace, Malling™ Champion, Murano). The trial was established from mini-tray (130cc) derived runner tips struck in August 2020 and overwintered in closed, unheated polytunnels. These were planted on 31st March 2021 into wetted up white Botanicoir Precision Coir bags (Botanicoir, London, UK) at density of six plants per metre, with two replicates (1m bags) of each new selection. Plants were de-blossomed on May 24th 2021 and runners were counted and removed from June 15th 2021 and again in mid-July and mid-August, although two runners per plant were retained to provide tips for dissection of meristems. Harvesting began on June 29th and continued twice weekly until September 23rd 2021.

Offsite Growers trials

EMSBC offsite growers' trials are hosted and financed by individual EMSBC members on their own farms, so only a brief summary of trial methods for these trials are presented. Thirteen offsite growers' trials overall hosted 60-day, main crop and everbearer trials.

Offsite main crop (June-bearer) growers' trials

Four advanced selections (EM2628, EM2696, EM2721 and EM2723) had been overwintered on growers' sites from the 60-day trials in 2020 and were assessed as maincrop (2nd year) in 2021. All UK plantings had been made in substrate under polythene-clad tunnels.

Offsite 60-day (June-bearer) growers' trials

Five advanced selections were assessed for yield and fruit quality in small-scale 60-day offsite trials in 2021: EM2583, EM2625, EM2763, EM2770 and EM2797. All UK plantings were in substrate under polythene-clad tunnels. Selections were trialled in small-scale trials (60 tray/250cc plants per site) having been selected for growers' trials in 2019.

Offsite everbearer growers' trials

Two advanced everbearer selections were assessed for yield and fruit quality in offsite trials in 2021: two (EMR862 and EMR863) in small-scale trials (60 mini tray/130cc) per site) and one (EMR794) in large-scale trial (a maximum of 1000 mini/130cc per site). All UK plantings were in substrate under polythene-clad tunnels.

Results and Discussion

NIAB East Malling June-bearer trial

Plants established well, and flowering and fruiting advanced quickly in favourable weather conditions following planting. During the cropping season some plots of Malling™ Centenary had to be removed due to crown rot. No other selections in trial showed symptoms of crown rot infection.

The trial data for the four selections chosen to progress to growers' trials in 2023/24 are shown in Table 6, and a short description of each follows:

EM2903 (Early)

An early season selection that had a mean 50% pick date 5 days ahead of Elsanta and just ahead of Clery (Figure 1.b.). Class 1 yield was low but had good fruit size and a high percentage of Class 1 fruit (Figure 1.c.). Fruit was well-displayed, and plant had a good habit but with moderately strong vigour. Berries were glossy and attractive (Figure 1.a.), although primaries could be creased with a hollow cavity. Flavour was noted as being sweet on a couple of occasions, but texture fluctuated from 'meaty' through to 'woolly'. Flavour and Brix scores were comparable to Clery. Shelf life was good, with berries noted as retaining their bright appearance. Predictive disease scores indicate some possible resistance powdery mildew but only intermediate resistance to crown rot.

Figure 1.a. Fruit of EM2903

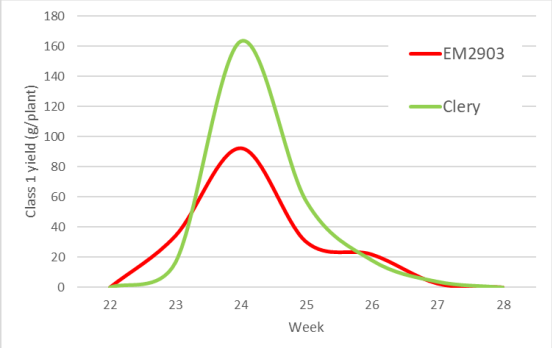

Figure 1.b. Cropping profile of EM2903

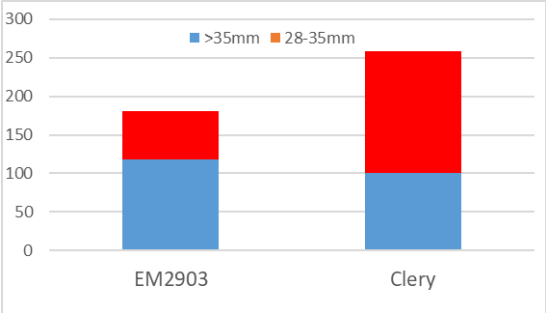

Figure 1.c. Mean Class 1 yield per plant (g/plant) of EM2903, compared to Clery (early season standard)

EM2910 (Early-midseason)

A selection that was similar to Malling™ Centenary, with similar season, yield and fruit size (Figures 2.b. & 2.c.). Berries had a bright, orange-red skin (Figure 2.a.), which retained its glow in shelf-life only being marked down due to number of bruises. The shoulders of the fruit were noted as being soft/fragile on some picks. Flavour was described as being pleasant, sweet and fruity but with acidity and citrus tones noted on some picks. Fruit was easy to pick and plants had a good, if not slightly dense habit. No disease was seen, but some tip burn was noted on some leaves towards the end of the season. Predictive disease resistance scores indicate some potential resistance to crown rot and powdery mildew.

Figure 2.a. Fruit of EM2910

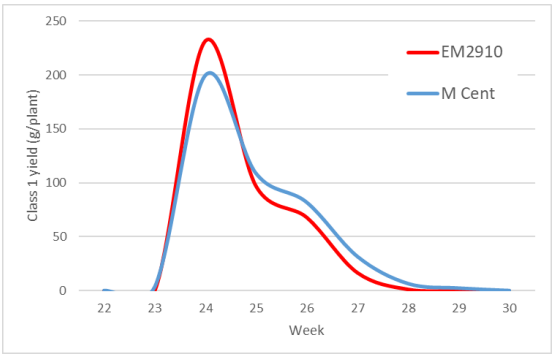

Figure 2.b. Cropping profile of EM2910

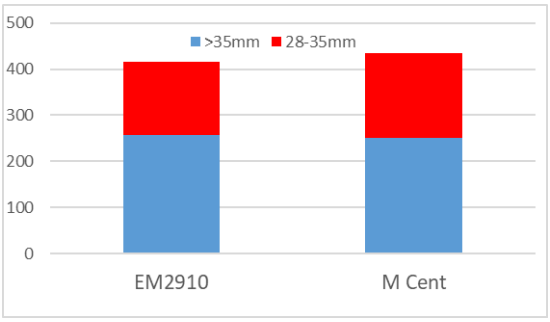

Figure 2.c. Mean Class 1 yield per plant (g/plant) of EM2910 compared to Malling™ Centenary.

EM2925 (Early-midseason)

EM2925 had a similar season to Malling™ Centenary but had an unusual crop profile with a 'second' flush of fruit halfway through it season (Figure 3.b.). Class 1 yield was slightly lower than Malling™ Centenary, but with larger fruit size and higher % of Class 1 fruit (96%) (Figure 3.c.). Berries were bright and glossy, with an orange-red skin colour, lighter than with Malling ™Centenary, and had good skin and flesh firmness. Appearance and firmness were retained in shelf life with one plot having excellent scores but the second plot being marked down for botrytis rots. Flavour was variable but ranged from watery to sweet, and with a good average Brix score. Plants had a

good habit, with fruit held on long trusses, but slightly clustered.

Figure 3.a. Fruit of EM2925

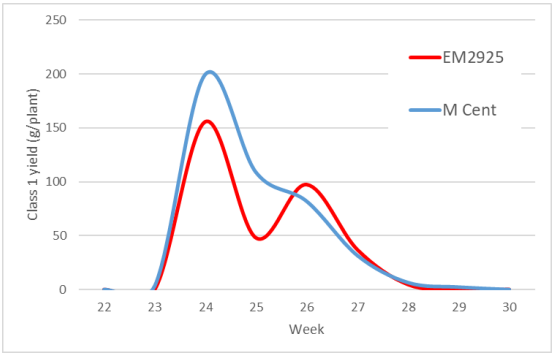

Figure 3.b. Cropping profile of EM2925

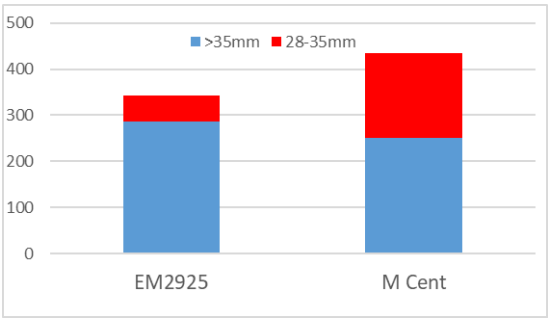

Figure 3.c. Mean Class 1 yield per plant (g/plant) of EM2925 compared to Malling™ Centenary.

EM2933 (Midseason)

A mid-season selection (Figure 4.b.) with Class 1 yield similar to Malling™ Centenary, but with larger fruit size (72%) (Figure 4.c.). Berries had good flesh and skin firmness and were brighter in appearance, but with slightly more sunken seeds, than Malling™ Centenary. Flavour was variable, sometimes described as having an acidic aftertaste and meaty textrure. Berries had a good gloss, which was noted on numerous occasions throughout the harvest.

Figure 4.a. Fruit of EM2933

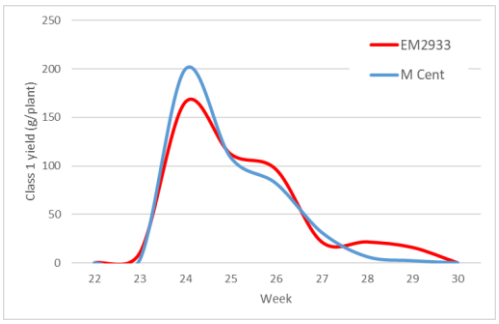

Figure 4.b. Cropping profile of EM2933

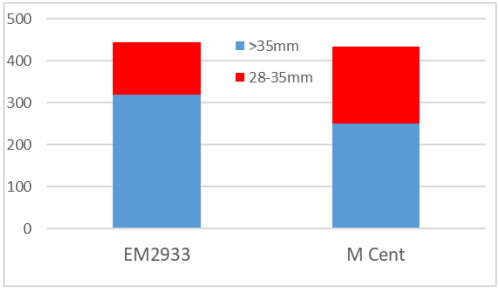

Figure 4.c. Mean Class 1 yield per plant (g/plant) of EM2933, compared to Malling™ Centenary.

NIAB East Malling Everbearer trial

The trial was planted on 31st March 2021, and were de-blossomed on May 24th 2021, with runners counted and removed from June 15th 2021 and again at the beginning of July, although two runners per plant were retained to provide tips for dissection of meristems. This was the second season that everbearer selections had been trialled in the new, substrate trial site at NIAB EMR, East Malling. The trial was maintained on table tops under Haygrove Pioneer tunnels using an automatic irrigation system using Delta-T sensors. The planting coincided with a period of cold and dull weather and there was little improvement in conditions until June when a short period of warm, sunny weather led to first fruiting. Relatively cool, dull and wet weather resumed with

limited an infrequent periods of warm and sunny weather. These poor growing conditions appeared to negatively impact on both fruit quality and yield, with production estimated to be 20-30% down on the standards compared to 2020. Pest control was good throughout the season although SWD became more prevalent from the end of August. Disease control was more challenging, with high disease pressure for powdery mildew noted in July and again from late August and into September. Powdery mildew was noted on fruit on both standards and new selection, but at a minimal level. Advice and recommendations on fertigation regimes and spray programmes were provided by a qualified, industry agronomist and the plot was visited and inspected every two weeks.

The results from the most promising selections for UK growers is summarised in Table 7. Data quality, yield and plant characteristics were considered together to identify the most promising selections trialled in 2020. The EMSBC Board decided to progress two selections to UK growers' trials in 2022, and the descriptions of these selections appears below:

EMR943

EMR943 was the highest yielding selection in the trial, but fruit size was only intermediate. The percentage of class 1 was high & comparable to Malling™ Ace (Figure 5.c.). Fruit was attractive, with short-conic/heart-shaped berries, and leafy calyx on primary berries (Figure 5.a.). Flavour was pleasant, with complex notes, including perfumed aromatics & blackcurrant, but was marked down for having a dry texture on some occasions. Skin firmness was good, and flesh firmness although soft on the first picks. Berries retaining their glossiness & vibrancy after shelf life tests. Fruiting season mirrored that of Murano and held steady from mid-July onwards (Figure 5.b.). Plants were more vigorous than the standards with a denser habit, but berries were very well-displayed on long, strong trusses. Some mildew was noted on fruit during periods of high disease pressure but this was minimal, & predictive scores indicated EMR943 may have strong resistance to crown rot.

Figure 5.a. Fruit of EMR943

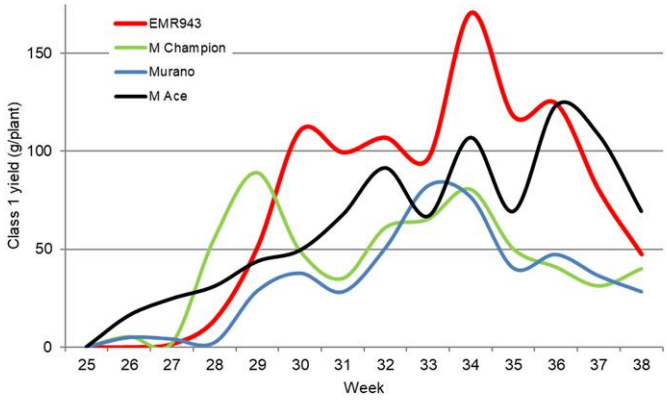

Figure 5.b. Cropping profile of EMR943

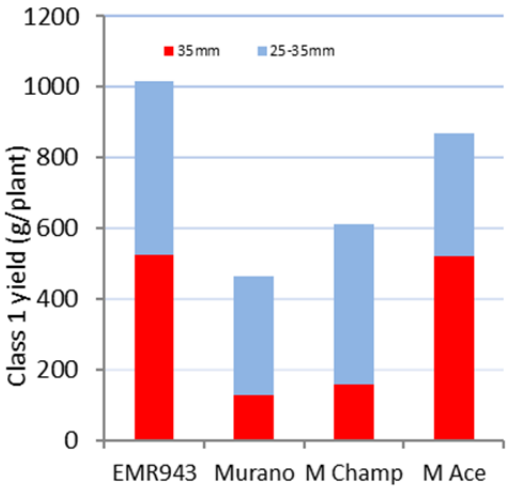

Figure 5.c. Mean Class 1 yield per plant (g/plant) of EMR943 compared to standards

EMR965

EMR965 had a high yield, similar to Malling™ Ace (Figure 6.c.). Fruit size & percentage Class 1 were very good and also similar to Malling™ Ace. An early peak of production was noted, following shortly on from Malling™ Champion but then cropped steadily for the remainder of the season (Figure 6.b.). Berries were not dissimilar to Malling™ Ace but were marked down for having a higher, white neck, some reflexed calyx and also some 'bent noses' (Figure 6.a.). Flavour was variable, but not dissimilar from Malling™ Ace & with a similar average Brix score. Skin & flesh firmness were good but noted as being 'spongy' on occasion. Shelf life scores were superior to Malling™ Ace & the brightness of berries was noted, although there was some drying up of calyx. Plants were healthy, with a slightly open habit but excellent fruit display on long trusses. Some mildew was noted on a few berries in early September, and predictive scores indicate EMR965 may have resistance to crown rot.

Figure 6.a. Fruit of EMR965

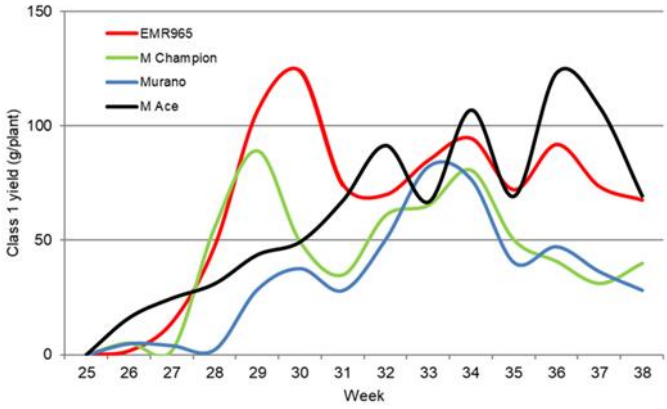

Figure 6.b. Cropping profile of EMR965

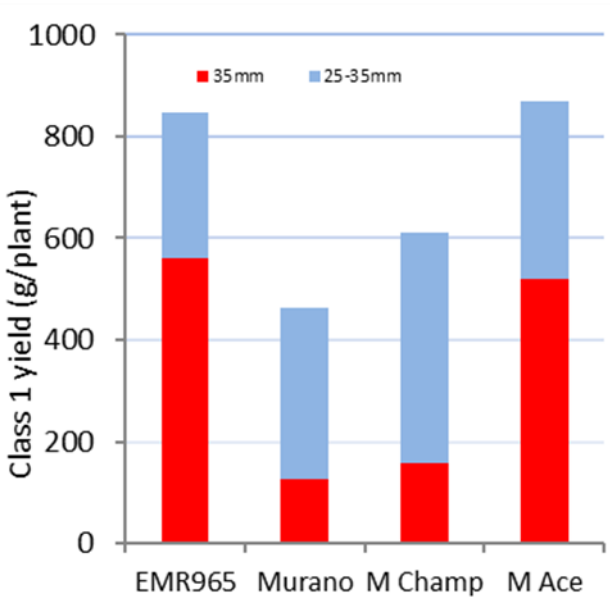

Figure 6.c. Mean Class 1 yield per plant (g/plant) of EMR965 compared to standards

Offsite main crop (June-bearer) growers' trials

The results of the offsite main crop growers' trials were reviewed by the EMSBC Board on September 7th 2021 and it was agreed that one selection, EM2723, should continue to large-scale offsite trials in 2023/24. Trialling of EM2583, EM2625 and EM2763 would discontinue as they had been superseded by better selections in the pipeline.

A summary of the performance of EM2723 is described below:

EM2723 is a mid-late season selection, with the bulk of production fitting between Malling™ Centenary and Malling™ Allure. The average Class 1 yield across all sites was 679g per plant (maximum 841g per plant) with production following a steady cropping profile. The average percentage of Class 1 fruit (89%) was slightly inferior to Malling™ Centenary (95%), but average fruit size was very similar (20.3g and 20.1g respectively). Berries had a uniform conic shape but had a darker appearance than Malling™ Centenary and Allure. Flesh firmness was good, but skin firmness could be weaker than the standards. Sensory flavour was judged as pleasant, with a high average Brixº of 9.3º as main crop. EM2723 is moderately susceptible to crown rot and powdery mildew, but has intermediate resistance to Verticillium wilt

Offsite 60-day (June-bearer) growers' trials

The results of the offsite growers' trials were reviewed by the EMSBC Board on

October 14th 2021 and it was agreed that two selections (EM2770 & EM2797) trialled in the small-scale, 60-day trials should continue to main crop offsite trials in 2021. Trialling of EM2583, EM2625 and EM2763 would discontinue as they had been superseded by better selections in the pipeline.

A summary on the performance of EM2770 and EM2797 is described below:

EM2770 a mid-late season June-bearer. Average Class 1 yield was 440g per plant across all sites. It had large average fruit size (26.1g), with berries displayed well on simple trusses, despite having quite a vigorous, upright plant habit. Berries had firm skin and flesh and a regular conic shape, but characterised by a slight high neck and leafy calyx. Flavour was found to be variable across sites, but gave an average Brix score of 8.9°. Preliminary disease tests and field observations indicate that EM2770 is intermediate for resistance to crown rot, but intermediate-moderately susceptible to powdery mildew and susceptible to Verticillium wilt.

EM2797 is a late season with a 50% pick date approximately 10-14 days after Malling™ Centenary. Class 1 yields were generally lower than Malling Centenary, although fruit size was good (21.3g). Plants had low vigour, with a slightly open habit, and berries were displayed on long trusses, giving an excellent fruit display. Berries were attractive, with a bright, glossy appearance and an excellent, consistently sweet flavour and an average Brix of 10.3°. Preliminary disease tests indicate that EM2797 may be moderately susceptible to crown rot, susceptible to Verticillium wilt but a good level resistance to powdery mildew.

Offsite everbearer growers' trials

The results of the offsite growers' trials were reviewed by the EMSBC Board on October 14th 2021. Two selections (EMR862 and EMR863) were assessed in small scale offsite growers' trials, and it was agreed that EMR863 should continue to large-scale trial in 2023. Trialling of EMR862 would discontinue as it had been superseded by better selections in the pipeline.

One selection was assessed in large scale trials: EMR794 and will continue in large-scale trial in 2022 and 2023.

A summary on the performance of EMR794 and EMR863 is described below:

EMR794 is a productive selection that is similar in main attributes to Malling™ Ace. In large-scale trial it had a high, average percentage of Class 1 fruit (93%), good fruit size (24.2g) and average of 761g of Class 1 fruit per plant (cf. 773g from Malling™ Ace). Berries were attractive but were reported to have pale/white flesh. Skin and flesh firmness were good, with a pleasant, juicy flavour and average Brix of 8.5°. Plants have an open canopy, with variable truss length, although fruit display and picking speeds were judged to be very good. Preliminary disease tests and field observations indicate that EMR794 is moderately resistant to intermediate for crown rot, susceptible to Verticillium wilt and intermediate (variable) to powdery mildew.

EMR863 is good flavoured everbearer with attractive fruit. Class 1 yields across sites was moderate, but with a high percentage of Class 1 fruit (92%) and good average fruit size (22.6g). Berries were easy to pick, despite some variation in truss length. Berries were firm, but could have a 'hard core', however flavour was consistently good and sweet with an average Brix score of 9.3°. Preliminary disease tests and field observations indicate that EMR863 has moderate resistance to crown rot and powdery mildew, but some susceptibility to Verticillium wilt.

Table 6. NIAB East Malling June-bearer results (standard in *italics*)

Selection	Class 1 yield (g/plant)	% Class 1	% large fruit (>35mm)	Appearance (1-9)	Skin firm (1-9)	Flesh firm (1-9)	Flavour (1-9)	Shelf life score (1-5)	Mean Brixº	50% pick date	Vigour (1-5)	Density (1-5)	Display (1-3)
EM2903[1]	181	93	65	5.7	6.0	6.1	5.7	4.0	7.4	15 June	4	2	3
EM2910[1]	415	90	63	5.5	5.2	5.6	5.4	2.9	8.2	19 June	4	3	3
EM2925[1]	343	96	84	5.8	6.0	5.8	5.3	3.0	8.4	22 June	4	2	3
EM2933[1]	444	93	72	5.5	5.9	6.1	5.3	3.7	8.4	21 June	5	-	-
M. Cent[2]	435	93	59	5.8	5.9	5.8	5.5	3.6	8.0	20 June	4	2	3

[1]Mean of two plots [2]Mean of eight plots

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

Table 7. NIAB EMR Everbearer trial results (standards in *italics*)

Selection	Class 1 yield (g/plant)	% Class 1	% large fruit (>35mm)	Appearance (1-9)	Skin firm (1-9)	Flesh firm (1-9)	Flavour (1-9)	Shelf life score (1-5)	Mean Brixº	50% pick date	Vigour (1-5)	Density (1-5)	Display (1-3)
EMR943[1]	1022	88	52	5.8	5.9	5.9	5.2	3.4	7.7	23 Aug	4	4	3
EMR965[1]	922	89	61	5.3	5.5	5.7	5.2	3.0	8.4	16 Aug	4	3	3
M. Ace[2]	*868*	*88*	*61*	*6.1*	*5.7*	*5.9*	*5.3*	*2.0*	*8.5*	*19 Aug*	*3*	-	-
M. Champion[3]	*606*	*66*	*26*	*5.4*	*6.3*	*6.5*	*5.1*	*2.6*	*7.8*	*13 Aug*	*3*	*4*	*3*
Murano[3]	*464*	*60*	*26*	*5.3*	*5.5*	*5.8*	*5.3*	*2.5*	*8.4*	*20 Aug*	*3*	*3*	*3*

[1]Mean of two plots [2] Mean of three plots [3]Mean of six plots

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

Conclusions

NIAB East Malling June-bearer trial

- Four selections. EM2903, EM2910, EM2925 and EM2933 were identified as being of sufficient interest to progress to offsite growers' trials in 2023 (60-day) and 2024 (main crop). EM2903 is particularly noticed for its early season of production.

NIAB East Malling Everbearer trial

- Two new selections, EMR943 and EMR965 were identified as being of sufficient interest to progress to growers' trials in 2023. EMR943 has high yield potential combined with a good flavour profile, and EMR965 has similar yield and fruit size to Malling™ Ace, but with an earlier production peak.

Offsite main crop (June-bearer) trials

- One advanced selection, EM2723 that was trialled in 2020/2021, will progress to larger-scale offsite trials in 2023/24. EM2723 is a mid-late season selection, with the bulk of production fitting between Malling™ Centenary and Malling™ Allure, with a pleasant flavour and high average Brix^{o} (9.3^{o}).

Offsite 60-day (June-bearer) trials

- Two advanced selections, EM2770 and EM2797, were deemed to have performed sufficiently well to carry forward to main crop offsite trials in 2022. EM2770 a mid-late season June-bearer, with large fruit size (average 26.1g), attractive fruit, good flavour and average Brix score of 8.9°. EM2797 is a late season June-bearer, characterised by very attractive, glossy berries and excellent, consistently sweet flavour (average Brix of 10.3°).

Offsite everbearer trials

- Two advanced selections will progress to large-scale trials: EMR794, will continue in trial in 2022 and 2023, and EMR863 will be trialled in 2023. EMR794 is a productive selection that is similar in main attributes to Malling™ Ace, having a high, average percentage of Class 1 fruit (93%), good fruit size (24.2g) and average of 761g of Class 1 fruit per plant (cf. 773g from Malling™ Ace). Berries are attractive, with a pleasant, juicy flavour and average Brix of 8.5°. EMR794 has moderate to intermediate resistance to crown rot, and intermediate resistance to powdery mildew. EMR863 is

a selection that produce sweet-flavoured berries, with an average Brix score of 9.3° across offsite trials. Preliminary disease tests and field observations indicate that EMR863 has moderate resistance to crown rot and powdery mildew.

Knowledge and Technology Transfer

Due to ongoing Covid 19 restrictions, no fruit walk for AHDB members took place in 2021 (as directed by the AHDB). However, Adam Whitehouse gave updates and reports on the EMSBC programme via the EMSBC Board and Technical Working Group meetings which AHDB representatives attended and participated in. One-to-one grower visits to the trial site were also arranged by request. In addition, Adam Whitehouse also presented on the programme to representatives of the industry, including AHDB levy payers, at the NIAB EMR Soft Fruit Technical Day on 16th November 2021.

Appendices

Appendix I. 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:

Comparison to standard	1=Much worse 2=Worse 3=Same 4=Better 5=Much better

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