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Contents

Grower Summary

1.1 Headlines

In the ongoing series of HDC Variety Evaluation Trials for Apples and Pears two trials (trial 39 and 40) have reached their conclusion.

- Two early season varieties from Variety Trial 39, Cybele and Delorgue, are highlighted as worthy of further consideration for specialist markets.
- One late season varieties from Variety Trial 39, Fukunishiki, is worthy of further consideration.
- Growers planning new orchards should consider one late season variety from Variety Trial 39, Cameo.
- No variety selections in Variety Trial 40 are considered to offer any opportunities to growers.

1.2 Background and Expected Deliverables

The profitability of apple and pear production in the UK is currently poor. UK products usually taste better than the foreign imports, but rarely command a sufficient premium to compensate for the higher production costs. Apples and pears are needed that appeal to the public and retailers alike and command a premium price in the markets. This will best be achieved by the selection and proactive development of new scion varieties and/or 'clones' with unique attributes. Such varieties may be generated as part of UK or overseas programmes of breeding and selection. These varieties should be of high quality, distinct from the current 'commodity varieties' and/or offer opportunities for production in cultural systems with minimal chemical inputs (e.g. organic systems).

Objectives:

1. To increase the range of new scion selections evaluated from both UK and overseas sources.
2. To streamline the selection process as much as possible.
3. To network with other countries in variety evaluation so as to be aware of new information and planned exploitation initiatives at an early stage.
4. To aid the planned release of new varieties and advise on any further development work necessary (e.g. further storage work).
5. To communicate the results of the work effectively to all relevant facets of the apple and pear industries.
6. To review existing trials and report findings in preparation for the next phase of HDC funded Variety Development work that might be undertaken in future.

1.3 Summary of results and main conclusions

1. Advanced selections E83/4 and E210/198 from previous replicated trials and small-scale grower trials have been reviewed and details collated. E83/4 is being considered for further development due to its attractive fruit colour and good eating quality linked to good orchard performance. E210/198 is not recommended for further development, its dull fruit colour and unattractive fruit shape give a generally poor appearance and marketability despite favorable orchard characteristics.

2. Apple Variety Trial 39 has been terminated and results from 5 years cropping have been collated. Results from 2003 season indicate Delorgue, Cybele, Fukunishiki and Cameo offer opportunities for UK growers. Cameo is already being grown in UK as part of a marketing club arrangement. It is worth consideration for those growers prepared for the relatively late picking date and participate in the marketing club approach to developing the variety.

3. Apple Variety Trial 40 has evaluated, mainly varieties from the East Malling Research Apple & Pear Breeding Club programme. All are bi-coloured varieties and, despite some reasonable orchard performance, none have the outstanding attributes needed to compete in this crowded part of the UK apple market. This experiment was terminated after the 2003 crop.

4. Other variety trials are at an early stage of evaluation and no conclusions have been drawn to date on performance of individual varieties.

1.4 Financial Benefits

The varieties identified in trials offer the possibility of reducing unit costs of production by virtue of higher yield of quality fruit compared to many standard varieties. imports, but rarely command a sufficient premium to compensate for the higher production costs. The route to market will influence the return to growers. The development of the "Club" approach to marketing and variety development has much to commend it. Cameo is being developed in this way.

1.5 Action Points for Growers

When considering new plantings a number of varieties from this programme could be considered:

- Cameo is worth considering as a late variety with very good storage potential. It is well on the way to successful commercialization through a marketing club within Europe managed by the European license holder on behalf of members.
- The early varieties Cybele and Delorgue are worth considering in special situations.
- Fukunishiki is an exceptional late variety which might have merit for some growers on favourable sites

SCIENCE SECTION

2.1.1 Introduction

To evaluate new varieties of apples, a series of experimental plantings have been made, each containing at least two control varieties for comparative purposes. Cox's Orange Pippin (as Queen Cox clone) is the continuing long term standard, providing easy comparison for growers to assess results and giving continuity with historic data. Royal Gala is used as a modern, current standard variety, and Jonagold as a standard for high yield potential. Smoothee (a Golden Delicious clone) where included in experiments, provides a comparative standard with trials conducted elsewhere in Europe. Experiments are planned for completion after five crops have been recorded. This places a high selection pressure on varieties for precocity and high fruit quality from young trees.

2.1.2 Apple Variety Trial 39

Materials and Methods

Maiden trees on M9 rootstock were planted in March 1998 in a completely randomised block design at Bradbourne, East Malling. The trees are spaced at 4m between the rows and 2m within the row in single-tree plots, with 5 plots per variety. Additional trees of each variety are planted as guard plots. Fruit was thinned to singles but not spaced. From the 2002 crop onwards, data was collected from three replicates only. Fruit was picked when easily detached from the tree, each season and the yields of fruit recorded. Fruit was sized and graded and placed in cold store. Fruit was stored in air at 3ºC and assessed at monthly intervals for quality attributes using the EUFRIN fruit quality protocol (Appendix1). Where fruit was limited in volume after grading assessments were carried out at the most appropriate period for the variety. To help direct comparison of variety performance a selection index (0 - 30) was calculated for each cultivar taking account of fruit quality, size and total yield (Appendix 2). Cultivars were then ranked from 1 to 23 according to the selection index.

Results:

Trees established well in this trial and the first fruit crop was recorded in 1999. Crop yields ranged from 0.3 to 7.0 kg/tree, with Merlyn the best. Yields improved in each of the four following harvests (2000 – 2003), with 13.8 kg/tree from Royal Gala in 2003. Cumulative yields for the 4 years ranged from Fukunishiki (62.0kg/tree) to E234-23 (14.4kg/per tree) with significant differences between treatments (Table 1). There was insufficient fruit of each variety to give meaningful grading data or storage assessments from the 1999 crop. Some varieties have a high yield potential, with Cameo, Fukunishiki and Shamrock being particularly good in this respect. The poor yield potential of Amorosa and E234-23 (below Cox yield levels) effectively eliminate these varieties from further consideration. Precocity was seen in Cameo, Merlyn, Shamrock, Shinsei and Vanda, comparable to Smoothee. For class 1 grade-out of fruit only Cameo and Fukunishiki were comparable to Royal Gala.

Origin of Varieties in Trial

Variety	Parentage	Country of Origin	Breeder	Plant Variety Rights
Amorosa	Sport of Aroma	Sweden	Balsgard Research Institute	
Arkcharm	Prima x Hydrid36055	USA		
Berna	Open Pollinated Belle de Boskoop			
Bohemia	Sport of Rubin			
Cameo (Caudle)	Chance seedling	USA	Caudle-Smith	Pepiniere de Valois European licensee
Chevadel				
Cybele (Delrouval)	Delcorf x Akane	France	Delbard	Delbard
Delorgue (Festival)	Delcorf x Akane	France	Delbard	Delbard
Fukunishiki	Ralls x Delicious	Japan	Aomori Research Station	
Jubile (Dellollune)	Golden Delicious x Lundbytorp	France	Delbard	Delbard
Karina				
Merlyn	Jored x Liberty			
Shamrock	McIntosh Spur type x Starkspur	Canada	Summerland Research British Columbia	
Shensei	Golden Delicious x MacIntosh	Japan	Aomori Research Station	
Tukker	Lunteran x Lonneker	Netherlands	Wageningen University	
Vanda	Jolana x Lord Lambourne	Czechoslavakia		
Zlatka				
E 271-40		UK	EMR	Trials
E234-23		UK	EMR	Trials

N.B. Some varieties, especially those with a breeders selection code, are trialled under a trials license before PVTR is applied for.

Table 1a. Apple Variety Trial 39 - Total Yield (kg/tree) of fruit – 1999-2003

Variety	**1999**	**2000**	**2001**	**2002**	**2003**	**Total**
Amorosa	0.60	4.73	2.83	9.40	3.93	21.5
Arkcharm	0.33	2.55	6.57	8.44	17.84	35.7
Berna	0.90	5.10	4.50	12.00	7.30	29.8
Bohemia	1.90	5.62	9.66	9.87	10.98	38.0
Cameo	4.90	7.33	12.00	16.10	14.17	54.5
Chevadel	3.37	6.40	9.67	18.13	8.57	46.1
Cybele	4.63	3.10	9.70	8.33	21.18	46.9
Delorgue	2.47	3.93	5.73	10.33	10.13	32.6
E234/23	0.00	0.00	4.87	0.77	8.79	14.4
E271/40	3.57	4.40	7.17	9.07	15.27	39.5
Fiesta	2.53	4.77	10.90	7.03	12.97	38.2
Fukunishiki	1.73	5.33	13.40	21.13	20.37	62.0
Jubile	4.10	7.73	6.60	17.07	6.07	41.6
Karina	2.53	2.33	10.10	5.77	16.70	37.4
Merlyn	7.40	4.57	9.27	4.24	12.09	37.6
Queen Cox	1.77	3.67	6.27	10.3	7.77	29.8
Royal Gala	2.13	2.73	10.63	5.63	13.80	34.9
Shamrock	5.93	3.77	9.17	7.79	14.47	41.1
Shinsei	6.13	2.03	7.27	0.73	19.53	35.7
Smoothee	4.57	6.37	8.80	16.27	5.50	41.5
Tukker	2.93	4.00	7.50	7.47	11.33	33.2
Vanda	6.53	3.00	0.00	10.83	13.43	33.8
Zlatka	6.37	1.13	11.40	3.27	11.03	33.2
Significance	<0.001 (43 df)	0.003 (42 df)	0.010 (41 df)	<0.001 (40 df)	0.041 (39 df)	0.001 (44 df)
SED	1.229	1.639	2.906	4.075	4.930	8.07
CV (%)	44.8	48.8	44.5	52.2	49.0	26.5

Analysis of was undertaken on data from the three replicate plots for which yield was recorded for the full five years. Where there was a missing value for the data in a particular year, a figure was estimated using the yields obtained from the other replicate plots of that variety. These values were then included when calculating the total yield over the five years for each plot. There are statistically significant differences in yield between varieties, at the 95% probability level, where the significance value shown for a column is less than 0.05.

Table 1b. Apple Variety Trial 39 - Marketable Yield (kg/tree) of fruit –1999-2003

Variety	**1999 *****	**2000**	**2001**	**2002**	**2003**	**Total**
Amorosa	0.6	3.8	2.5	8.0	3.3	18.2

Arkcharm	0.3	2.5	6.2	7.9	16.3	33.2
Berna	0.9	3.9	3.6	10.9	4.3	23.6
Bohemia	1.9	4.3	8.2	8.2	8.9	31.5
Cameo	4.9	6.6	11.2	14.8	13.7	51.2
Chevadel	3.4	5.9	8.9	15.6	8.1	41.9
Cybele	4.6	2.9	8.6	7.6	18.7	42.4
Delorgue	2.5	3.2	5.0	8.9	9.2	28.8
E234/23	-	-	4.6	0.7	7.5	12.8
E271/40	3.6	4.0	6.5	8.6	13.4	36.1
Fiesta	2.5	3.9	10.5	6.2	12.0	35.1
Fukunishiki	1.7	5.1	12.6	19.2	19.4	58.0
Jubile	4.1	7.0	6.0	14.2	5.8	37.1
Karina	2.5	2.3	8.3	5.3	15.4	33.8
Merlyn	7.4	3.9	8.2	4.0	10.6	34.1
Queen Cox	1.8	3.0	6.1	8.8	6.1	25.8
Royal Gala	2.1	2.5	9.3	5.1	13.2	32.2
Shamrock	5.9	3.7	8.6	7.1	13.1	38.4
Shinsei	6.1	1.9	5.6	0.7	8.8	23.1
Smoothee	4.6	5.9	8.3	15.1	4.6	35.5
Tukker	2.9	3.7	6.6	5.9	8.7	27.8
Vanda	6.5	1.6	-	9.8	11.9	29.8
Zlatka	6.4	1.0	10.6	3.0	10.5	31.5

*** Fruit from young trees and insufficient to grade, total yield figure used.

Whilst yield is not the decisive factor in evaluating a new variety it is a crucial driver for orchard profitability. In total yield terms Smoothee and Royal Gala offer good comparision of potential yield performance and a number of varieties out yield these varieties, notable Cameo and Fukunishiki.

The most common reason for down grading was lack of colour on fruit. Cox suffered from russet and cracking which resulted in down grading as did Berna. Some brown rot also occurred in 2003 which caused some losses but no indication of variety interaction was observed. In terms of fruit quality again Cameo and Fukunishiki ranked alongside Royal Gala in performance. The size grade out of Cameo was disappointing but it had high yield and even thinning to singles was insufficient to bring size up. In commercial orchards, with lower levels of cross pollination than present in this trial, this problem is not likely to be so extreme but nevertheless fruitlet thinning will be crucial to successful production of Cameo. Down grading of Cameo was usually for lack of colour, in shaded fruits. The fruit size distribution of Fukunishiki was very good with down grading only for lack of colour, which given its late season colour development is always likely to be a problem. Cybele and Delorgue were prone to poor colour on some fruits with shading effects being very noticeable after picking. Shinsei has produced very large amounts of flower which set regularly and needed much higher levels of thinning than was imposed on this trial. To manage correctly in a commercial situation Shensei would require blossom thinning in every season. To make the most of this variety it would also need exceptionally careful handing to avoid bruising which shows up dramatically. There was an indication that Shinsei might be susceptible to rosy apple aphid which caused fruit shape problems in some years. Very precocious varieties like Royal Gala in this trial required a higher

level of thinning, especially in 2003, than was applied. Compared to Cox most varieties in trial had better fruit skin finished in terms of cracking and russetting.

Table 2: Apple fruit size & quality - Year 2003

Variety	Fruit Size (% Class1 & 2)						Quality (%)		
	<60mm	65-70mm	70-75mm	75-80mm	80-85mm	>85mm	Class1	Class2	Other
AMOROSA	11.1	38.9	0.22	0.0	0.3	0.0	66.7	22.2	0.0
ARKCHARM	9.7	17.5	29.4	26.5	5.1	3.1	62.2	29.2	8.6
BERNA	5.2	2.6	11.3	12.4	11.3	16.0	28.9	29.9	41.2
BOHEMIA	2.3	7.6	20.3	5.3	8.1	37.1	67.2	13.6	19.3
CAMEO	34.9	27.7	16.0	11.2	2.8	3.8	80.7	15.8	3.6
CHEVADEL	6.6	27.2	32.5	19.7	7.0	1.3	71.9	22.4	5.7
CYBELE	35.1	33.2	16.0	4.1	0.0	0.0	74.1	14.3	11.6
DELORGUE	7.0	12.8	20.2	34.2	13.6	3.3	72.8	18.1	9.1
E234/23	0.5	0.0	10.2	23.5	27.3	24.1	59.9	25.7	14.4
E271/40	20.0	25.7	16.0	17.7	6.4	1.8	76.5	11.1	12.4
FIESTA	17.3	23.8	20.0	17.3	8.3	5.6	73.4	19.0	7.7
FUKUNISHIKI	9.0	28.7	34.9	18.7	3.1	0.9	86.7	8.5	4.8
JUBILE	4.7	13.6	29.0	34.9	10.1	3.0	75.7	19.5	4.7
KARINA	8.8	20.4	21.4	24.0	11.1	6.6	67.2	25.0	7.8
MERLYN	44.9	25.2	12.5	3.7	0.6	0.9	64.2	23.7	12.1
QUEEN COX	20.6	31.1	16.7	4.3	6.2	0.0	52.2	26.8	21.1
ROYAL GALA	51.4	31.1	9.6	3.6	0.0	0.0	81.4	14.3	4.3
SHAMROCK	60.8	23.9	6.0	0.0	0.0	0.0	72.2	18.4	9.3
SHINSEI	45.8	0.0	0.0	0.0	0.0	0.0	14.3	31.5	54.2
SMOOTHEE	11.7	26.6	29.9	13.6	1.3	0.0	74.0	9.1	16.9
TUKKER	35.2	14.5	10.5	13.2	3.6	0.0	50.9	26.0	23.1
VANDA	9.4	33.4	34.4	11.4	0.0	0.0	72.9	15.7	11.4
ZLATKA	91.9	3.1	0.0	0.0	0.0	0.0	71.1	23.9	5.0

Varieties in this trial covered a wide range of harvesting season, ranging from early to mid August, Arkcharm to mid October, Fukunishiki. Of particular interest would be varieties which pick early for marketing prior to Cox. Cybele, Delorgue and Tukker would meet this requirement but fruit colour of Tukker is not as attractive as the other two varieties nor does it have as good a class 1 grade-out.

Table 3: Apple Variety Trial 39

Mean Harvest Dates 2000 to 2003

Variety	Pick Date
Amorosa	1 Sept.
Arkcharm	13 Aug

Berna	19 Sept
Bohemia	14 Sept
Cameo	13 Oct
Chevadel	28 Sept
Cybele	3 Sept
Delorgue	3 Sept
E234/23	6 Oct
E271/40	20 Sept
Fiesta	14 Sept
Fukunishiki	13 Oct
Jubile	30 Sept
Karina	5 Sept
Merlyn	17 Sept
Queen Cox	15 Sept
Royal Gala	22 Sept
Shamrock	6 Oct
Shinsei	11 Sept
Smoothee	28 Sept
Tukker	4 Sept
Vanda	16 Sept
Zlatka	29 Sept

The development of a selection index was driven by the desire to see if comparison of varieties could be facilitated by producing one indicator of measurable performance. The index developed (Appendix 2) achieves this to some extent, enabling attention to be focussed on those varieties which stand out from the rest. Key factors missing from this index is taste and visual appearance which are crucial in the market.

Those varieties with a higher selection index placing than Royal Gala and Fiesta are the principal targets for potential commercialisation. Arkcharm and Fukunishiki start and end the harvest season respectively. Both have attractive fruits. Arkcharm is a refreshing eating experience with a “typical” summer apples taste but has a very short product life which would limit its marketability. Fukunishiki is not highly coloured and its dull colouration might limit its appeal in a retail environment, it may also be difficult to mature the fruit in some seasons and sites. Karina has a poor eating texture and short product life. Cybele is attractive and provides a good eating experience. E271-40 has given good taste scores out of store but has had poor to variable texture ratings. It is harvested in mid season and does not have sufficiently outstanding attributes to displace other varieties in the mid season market. Cameo has considerable potential because of its late season and good storage potential. Fruit colour might be a problem if it proves to be too stripy and dull. Vanda scored poorly for eating quality although it is reported as having good tolerance to scab and mildew. Bohemia has a naturally soft texture which whilst not adversely affecting eating quality might limit its potential particularly as it picks in the congested mid season. Delgorue has a comaparable season to Cybele and further work would be required to judge which would provide the better candidate for early season marketing.

Table 4: Apple variety Trial 39 Selection index 2003

Variety	Quality	Size	Yield	Selection	Rank by
	Class1	%≥70mm	2003	Index	Index
AMOROSA	0.0	0.0	3.93	0.0	**23**
ARKCHARM	62.2	64.2	17.84	22.5	**2**

BERNA	28.9	51.0	7.30	5.8	**21**
BOHEMIA	67.2	70.8	10.98	15.1	**9**
CAMEO	80.7	33.8	14.17	16.2	**6**
CHEVADEL	71.9	60.5	8.57	11.4	**13**
CYBELE	74.1	20.1	21.18	20.0	**4**
DELORGUE	72.8	71.2	10.13	14.6	**10**
E234/23	59.9	85.0	8.79	12.7	**12**
E271/40	76.5	41.9	15.27	18.1	**5**
FIESTA	73.4	51.2	12.97	16.2	**6**
FUKUNISHIKI	86.7	57.5	20.37	29.4	**1**
JUBILE	75.7	76.9	6.07	9.3	**16**
KARINA	67.2	63.0	16.70	21.7	**3**
MERLYN	64.2	17.8	12.09	9.9	**15**
QUEEN COX	52.2	27.3	7.77	6.2	**20**
ROYAL GALA	81.4	13.2	13.80	13.1	**11**
SHAMROCK	72.2	6.0	14.47	11.3	**14**
SHINSEI	14.3	0.0	19.53	2.8	**22**
SMOOTHEE	74.0	44.8	5.5	6.5	**19**
TUKKER	50.9	27.3	11.33	8.9	**17**
VANDA	72.9	45.8	13.43	15.9	**8**
ZLATKA	71.1	0.0	11.03	7.8	**18**

N.B. Total fruit yield used as an indicator of yield potential.

Overall in the assessment of fruit from store the results have produced consistent results, year on year for a given variety. Of crucial importance are the taste scores both immediately ex-store and after 7 days "shelf-life" at ambient temperatures. In comparing variety performance it is suggested that score of 7 and 8 for taste are required for good commercial acceptability. If these levels are not achieved the variety is unlikely to progress. If once achieved this score level drops the variety has reached the end of its potential storage life in air storage.

Cameo has consistently score well for taste with fruit really needing a time in ambient conditions to develop taste fully after storage. Chevadel will only store until mid December at the latest. Fukunishiki has a very long storage potential, only developing taste after November in most seasons.

Table 5: Apple Variety Trial 39 Storage results 2002/03

Variety	Timing	TSS	FROM STORE					AFTER 7 DAYS FROM STORE				
			Firm	Ripe	Taste	Juice	Texture	Firm	Ripe	Taste	Juice	Texture
		%	kg	Score	Score	Score	Score	kg	Score	Score	Score	Score
Berna	Mid Jan.	14.4	7.2	7	4	5	7	6.7	9	3	3	7
Bohemia	Mid Dec.	14.3	5.4	5.5	5	7	7	5.4	5.5	6	7	7
	Mid Jan.	13.1	5.7	5.5	7	7	7	5.4	5.5	7	7	7

Cameo	Mid Dec.	16.1	8.4	4	8	8	3	7.4	4	8	8	3
	Mid Jan.	15.9	7.7	4	7	8	4	7.4	5	8	8	7
	Early Feb	16.4	7.9	3.5	8	8	3	7.1	4.5	8	8	4
Chevadel	Mid Dec.	14.1	5.7	5.5	8	6	7	5.2	5.5	7	6	7
	Mid Jan.	13.9	5.3	6	5	6	7	5.0	6	5	6	7
E 234/23	Mid Dec.	15.9	6.0	5	7.5	7	5	6.9	7	6	5	7
E 271/40	Mid Dec.	12.2	6.6	5	8	8	4	5.7	5	8	8	7
	Mid Jan.	12.4	6.4	4.5	7	7	4	6.4	4.5	8	7	4
Fiesta	Mid Dec.	14.2	7.8	4	7.5	7.5	3.5	7.3	5	8	8	7
	Mid Jan.	12.8	7.6	4.5	7	7	3	7.3	5	8	8	5
	Early Feb	12.9	7.8	5	8	8	5	7.2	5	8	8	7
Fukunishki	Mid Dec.	15.2	8.8	3	5	7.5	5	6.7	5	8	8	4
	Mid Jan.	15.0	7.1	5	7	8	7	7.0	5	8	8	7
	Early Feb	15.0	7.2	4.5	8	8	3	6.6	5	8	8	7
Jubile	Mid Dec.	13.7	5.5	5.5	7	8	7	4.9	6	8	6	7
	Mid Jan.	13.7	5.4	5.5	7	8	7	5.0	6	7	8	7
Merlyn	Mid Dec.	13.4	8.0	5	7	7	7	7.0	9	8	6	7
	Mid Jan.	12.6	7.2	5	7	8	7	6.6	5.5	7	7	7
	Early Feb	12.6	7.1	5.5	7	7	7	5.9	6	7	7	7
Queen Cox	Mid Dec.	14.3	5.6	6	6	7	7	5.4	7	6	6	7
Royal Gala	Mid Dec.	12.9	7.1	4.5	8	8	3	6.2	5	8	8	4
	Mid Jan.	12.6	6.8	5	7	8	3	6.1	5	7	8	7
Shamrock	Mid Dec.	13.6	7.1	5	8	7	5	5.5	5	8	8	7
	Mid Jan.	13.5	6.9	5	8	8	7	6.3	5	8	8	7
	Early Feb	13.6	6.4	5	8	8	5	5.7	5.5	8	7	5
Shinsei	Mid Dec.	13.7	6.0	5	8	8	5	5.7	6	7	7	7
Smoothee	Mid Dec.	13.4	5.2	5	8	8	7	5.0	6	7	8	7
	Mid Jan.	13.0	5.4	5.5	7	8	7	5.2	5.5	7.5	8	7
Tukker	Mid Dec.	14.8	5.5	5.5	5	7	7	5.1	9	3	6	7
Vanda	Mid Dec.	12.6	4.4	7	4	7	5	4.1	9	3	7	7
Zlatka	Mid Jan.	16.4	6.4	5.5	7	8	7	5.8	5.5	7	8	7

N.B. Fruit Quality Scores;

Taste: 1 = extremely poor, 9 = excellent

Ripeness: 1 = very unripe, 9 = over-ripe

Texture: 1 = extremely coarse, 9 = extremely fine

Juiciness: 1 = very dry, 9 = very juicy

Table 6: Apple Variety Trial 39 Storage results 2003/04

Variety	Sample Date	FROM STORE						AFTER 7 DAYS FROM STORE				
		TSS %	Firm kg	Ripe Score	Taste score	Juice score	Texture score	Firm kg	Ripe score	Taste score	Juice score	Texture score
Arkcharm	Late Sep	12.7	4.8	8	3	5	7					
	Mid Nov	12.3	4.5	9	1	7	7					
Berna	Mid Nov	15.8	9.1	5	6	6	7	8.2	7	3	3	7

	Mid Dec	15.2	7.4	6	5	5	6	7	6	4	3	7
	Mid Jan	14.8	6	6	6	6	6	6	6	6	5	7
Bohemia	Late Sep	14.6	7.6	3	6	7	3					
	Mid Nov	15.6	6.1	6	6	7	7	6.0	7	7	7	7
	Mid Dec	14.9	5.6	5	7	7	6	5.2	6	7	7	6
Cameo	Mid Nov	15.5	8.1	3	4	8	3	7.3	5	8	8	5
	Mid Dec	16.0	7.5	4	6	7	2	7.0	5	8	7	4
	Mid Jan	15.0	7.2	4.5	8	7	3	6.9	4.5	8	7	5
	Mid Feb	14.7	7.3	4.5	8	7	3	7.0	4.5	8	7	5
Chevadel	Mid Nov	16.2	6.8	5	8	8	5	6.2	6	7	7	7
Cybelle	Mid Nov	13.5	5.5	5	7	7	7	4.9	8	5	7	7
Delorgue	Late Sep	15.5	7.6	3.5	6	7	3					
	Mid Nov	14.6	6.5	6	6	7	7	5.7	6	6	7	7
E 234/23	Mid Nov	17.2	8.3	3	5	8	3	7.2	5	8	8	5
E 271/40	Mid Nov	13.2	7.2	4	5	8	4	6.7	5.5	7	7	7
Fukunishki	Mid Nov	16.2	8.9	3	7	8	3	7.3	4.5	8	8	6
	Mid Dec	16.0	8.0	4	8	7	4	6.3	4	8	7	5
	Mid Jan	15.6	7.3	4.5	8	7	4.5	6.4	5	8	7	6
	Mid Feb	16.1	6.5	5	8	7	6	5.7	5	7	7	7
Jubile	Mid Nov	16.4	7.0	4	7	7	3	6.5	6	6	6	7
Karina	Late Sep	14.6	4.8	8	3	3	7					
	Mid Nov	15.1	4.9	9	3	5	7					
Merlyn	Mid Nov	15.1	7.8	4.5	8	7	6	7.1	6	7	6	7
	Mid Dec	14.0	6.8	5	7	6.5	6	6.5	6	6	6	7
	Mid Jan	13.7	6.2	5	7	7	7	6.2	6	6.5	6	7
	Mid Feb	12.6	6.3	5.5	6.5	6	7	5.6	6	5	5	7
Queen Cox	Mid Nov	15.2	5.4	5.0	7	6.5	5	5	5	7	6	7
	Mid Dec	15.7	5.5	4.5	5	6	7	5	5.5	5	6	7
Royal Gala	Mid Nov	15.4	7.9	3	5	7	4	6.6	6	5	6	6
Shamrock	Mid Nov	17.1	6.5	5	8	8	7	5.8	6	7	8	7
	Mid Dec	15.0	5.6	5	7	7	8	5.3	5.5	7	7	7
	Mid Jan	14.5	4.9	5	8	7	8	5.2	5	7	7	7
	Mid Feb	14.2	5.1	5	8	7	6	5.5	5	7	7	7
Shinsei	Late Sep	12.4	8.6	3	5	6	3					
	Mid Nov	12.7	6.3	5	7	8	7	6.0	5	8	8	7
	Mid Dec	13.2	6.1	5	7	7	5	5.9	5	7	7	7
	Mid Jan	12.8	5.7	5	7	7	7	5.5	5	7	7	7
Smoothee	Mid Nov	17.1	7.1	5	7	7	7	6.8	5	7	7	7
Tukker	Late Sep	14.1	7.9	4	6	6	5					
	Mid Nov	15.3	6.0	9	5	5	7					
Vanda	Mid Nov	14.7	5.6	8	3	6	8	5.0	8	3	6	8
Zlatka	Mid Nov	16.2	6.8	5	7	7	7	6.4	5.5	7	7	7

N.B. Fruit Quality Scores; Taste: 1 = extremely poor, 9 = excellent
Ripeness: 1 = very unripe, 9 = over-ripe
Texture: 1 = extremely coarse, 9 = extremely fine
Juiciness: 1 = very dry, 9 = very juicy

No problems with flowering or pollination were observed in this trial. Despite its late pick date the flowering of Fukunishiki is not too dissimilar to other varieties.

Table 7: apple Variety Trial 39 Mean Flowering Periods – 2000 to 2003

Variety	First Flower 10% Open	Full Flower 80 % Open	Flowers 90% Over
Amorosa	27 April	30 April	6 May

Arkcharm	24 April	28 April	4 May
Berna	29 April	3 May	8 May
Bohemia	28 April	30 April	5 May
Cameo	27 April	30 April	7 May
Chevadel	23 April	26 April	2 May
Cybele	22 April	28 April	3 May
Delorgue	26 April	29 April	5 May
E234/23	1 May	4 May	12 May
E271/40	26 April	29 April	4 May
Fiesta	28 April	1 May	8 May
Fukunishiki	30 April	3 May	11 May
Jubile	25 April	28 April	6 May
Karina	21 April	24 April	1 May
Merlyn	23 April	27 April	4 May
Queen Cox	29 April	2 May	9 May
Royal Gala	28 April	1 May	7 May
Shamrock	20 April	24 April	30 April
Shinsei	26 April	29 April	5 May
Smoothee	28 April	1 May	6 May
Tukker	24 April	28 April	4 May
Vanda	19 April	25 April	30 April
Zlatka	22 April	27 April	3 May

Variety Profiles

Amorosa

A sport of Aroma (Ingrid Marie x Fillippa), from Balsgard Research Institute, Sweden. Early variety, picking in late August with a short season of use. Dark red coloured fruit with a pinkish bloom over a light green background colour, round conical in shape. Poor yield potential, although fruit size was good. In common with other large fruited early varieties, fruit can readily "blow" open. Fruit texture is soft and weak.

Arkcharm
Bred at the university of Arkansas from Prima x Hybrid 36055. Fruit is coloured pinkish red over a light green/pale yellow background and has prominent lenticels appearing as russet spots. It has a very early, short season picking in mid-August. Fruit is of poor taste and low firmness. Fruit size is large, but moderate yield (Cox level). Poor tree shape that would need careful management. Despite high selection ranking (driven by fruit size and exceptionally high 2003 crop) poor eating quality, soft fruit and lack of precocity eliminate this variety.

Berna
Raised from open pollinated Belle de Boskoop in Belgium. Picks later than Cox, late September or beginning of October, with modest yield but poor class 1 grade-out. Fruit has a poor shelf –life and indifferent taste. The tree is very vigorous and would need to be tied down. Some *Nectria* canker has been seen in trees.

Bohemia
A sport (chance mutation) of the variety Rubin. (Rubin itself resulted from a cross between Lord Lambourne x Golden Delicious). Pink/red coloured fruit on light green background colour. which is conical, blocky, short-oblong shape and large in size. Picks at same time as Cox. Yield level is good and showed storage potential. Fruit was best eating from store in January but can be soft textured, though not unpleasantly so when in optimum eating condition. Tree is a tip bearer with good bud, but two-year wood is almost entirely bare. Feathers have reasonably good angles.

Cameo; (synonym: Caudle)
A chance seedling from Washington State, USA. Produced fruit with a distinctive appearance and good eating as well as having a yield potential higher than Smoothee. The dull red colour of fruit at harvest can develop in store. Fruit has a light green background colour, is conical in shape that can be irregular at eye. Late season, picking early to mid October. Good yield potential, precocious with good class 1 and fruit size. Gives very good crisp eating experience even from mixed variety storage in air, well into February. Fruit also has a good shelf life. From the trials experience it does need careful management of crop load to achieve consistent fruit size. Tree is well furnished and of moderate vigour but with a slight tendency to produce some bare wood.

Chevadel
Harvests late September with acceptable yield and good fruit size (60% over 70mm). Taste dropped after December and fruit has a naturally low firmness at optimum maturity. Tree is of moderate vigour with a good selection of fruiting wood. Growth can be slightly upright and may need to be tied down.

Cybele; (synonym: Delrouval*)*
A Delcorf x Akane cross from Delbards Nursery in France that has attractive fruit with a pinkish blush-striped, over a pale green tinged yellow background. Bright appearance and good even round shape. Harvests in mid to late August providing an interesting possibility for early season sales. It has good yield potential and high, class

1 fruit but not a long storage life in mixed variety air storage. The trees have performed well despite relatively poor tree shape.

Delorgue: (synonym: Festival.)
A Delcorf x Akane cross from Delbards Nursery in France. Fruit needs to be thinned early to achieve commercial fruit size. Fruit has a red colour over a pale green background, somewhat like Royal Gala, with slight russet around the stalk cavity. Oblong in shape, it has an open eye and can be slightly lopsided. It is harvested in late August, competing for the same marketing period as Cybele, which is marginally earlier. It has good yield and acceptable class 1 turnout of large fruit (51% 75 mm or over) but does not appear to have storage potential. The tree is fairly vigorous, with wide angled feathers and good quality buds, but also some bare wood.

Fukunishiki
A Japanese variety, from Aomori Research Station, (Ralls x Delicious), producing fruit that has a pinkish bloom with dull red over a light green background colour. Fruit is round-conical and very even in shape. High yielding with good fruit size profile, class 1 grade out and good storage potential, after which shelf life is good. It has a very late season, similar to Fuji, picking in late October, after Cameo. Vigorous tree which may be a triploid, with upright growth that would need to be tied down.

Jubile; (synonym: Dellgollune*)*
Resulted from a cross (Golden Delicious x Lundbytorp), from Delbards Nursery in France. Fruit had a delicate aromatic flavour and is crisp and juicy although it can have a thick skin, but this does not detract from its eating quality. Naturally low fruit firmness although eating quality is unaffected from mixed variety storage in air until January. Produces an acceptable but variable yield with signs of inconsistency. Quite a vigorous tree but it is well furnished with buds.

Karina
Round-conical shape fruit, irregular, with deep red, pink colour and short stalk. Fruit is unattractive in appearance. Picks in mid to late August but fruit quality is inferior to Delorgue and Cybele. Produces a good yield but with a disappointing class 1 out turn and poor taste scores from poor textured fruit. The tree is reasonably well balanced with wide branch angles and medium vigour.

Merlyn
Raised from Jored x Liberty and received from J. Nicolai, in Belgium. A precocious variety with good yield but relatively small fruited and with a low class 1 grade out. Fruit is harvested at the same time as Cox. Both taste and texture held well from store into February. It produces a tree similar in many respects to Egremont Russet.

Shamrock
A cross between McIntosh (irradiated spur type) x Starkspur (Golden Delicious) raised at Summerland, British Colombia, Canada. Good crops of fruit green/yellow in colour; a Granny Smith type variety with good storage potential. It is precocious with a high yield potential but poor fruit size. It requires heavy thinning of fruit in most seasons. Picking date is later than Cox, at end September. Fruit eats well from store in

February with a similar firmness to Cox. Produces a tree of moderate vigour and wide branch angles that crops on all ages of wood.

Shensei
From Aomori, Japan. Golden Delicious x Early McIntosh. Has given good crops, of fruit green/yellow in colour, but its heavy cropping can result in biennial bearing and small fruit size. Would need very heavy thinning in most seasons. Fruit has sweet, scented taste giving a crisp, juicy eating experience. Fruit is picked in September just before Cox. Does not appear to have storage potential. Produces a tree with wide branch angles and which is easy to manage.

Tukker
Raised at Wageningen, Netherlands from Lunteran x Lonneker. Short round-conical shaped fruit with a stripey red colour over a light green background with bright appearance and russet around the stalk cavity. Shape can however be irregular. Fruit is picked in September, at the same time as Cox. Produced an acceptable yield but has poor eating quality and a small fruit size. Tree is vigorous producing upright growth prone to bare wood. Has some resistance to scab and mildew.

Vanda
Raised from Jolana x Lord Lambourne, in Czechoslavakia. Round-conical shaped fruit with a bright red colour over a pale green background. Fruit is picked in the second week of September on average, coinciding with Cox. Gave reasonable yield of good-sized fruit but scored poorly for eating quality. Has some scab and mildew resistance. Tree bud up well on all ages of wood and would need thinning in most seasons.

Zlatka
Dull red coloured fruit that has a pale green background colour; round, conical in shape. Fruit is picked at the same time as Cox with acceptable yield, but very small fruit size even after thinning. Eating quality is moderate. Produces a tree of moderate vigour with well angled feathers.

E271-40
Mixed red variety from East Malling Research breeding programme, produced acceptable yield, class 1 and fruit size distribution. Has given variable eating quality. Fruit picked at same time as Cox. Not sufficiently high yield nor distinctive other qualities to justify further evaluation. Has a well formed tree cropping in first season with buds on all ages of wood. Well furnished. Heavy cropping on 1 year has led to droopiness suggested remedy,- tip 1 year leaders and 'lift' branches/skirts.

E234-23
Mixed red variety from East Malling Research breeding programme has produced very poor yields. The tree is vigorous with a good supply of spurs and with a tendency to produce dominant narrow angled branches.

AMOROSA

ARKCHARM

BOHEMIA

CAMEO

CYBELE

DELORGUE

E271-40

E234-23

FIESTA

FUKUNISHIKI

JUBILE

KARINA

MERLYN

ROYAL GALA

SHAMROCK

SHINSEI

SMOOTHEE

TUKKER

VANDA

ZLATKA

Discussion and conclusions

For the early season market Cybele and Delorgue offer good potential. They have comparable yield levels and class 1 fruit but Delorgue has the larger fruit size. In common with many early varieties these will require picking over to ensure that colour and maturity are optimised. In this trial Cybele produced fruit with the more attractive appearance. No other early varieties merit consideration for commercial growing. The performance of mid season varieties was generally disappointing.

Two late season varieties are worth consideration. Cameo offers growers a late picking, quality variety with a high yield potential, good storage potential and an excellent eating experience. It is being grown by some growers in UK and is subject to licence agreement that is developing the market for the variety through a “Club” arrangement. It is well worth growers considering this variety in future planting plans. The second variety, Fukunishiki, whilst having many useful attributes, including storage potential and high yield, high class 1 fruit and large fruit size, it is nevertheless very late picking. It is not unlike Fuji in appearance but has a fairly dull colour to the fruit. It is however worthy of further consideration.

2.1.3 Apple Variety Trial 40

Materials and methods

Maiden trees of four selections were planted in March 1998 at a spacing of 4m x 2m in a complete randomised block design with 5 replicates per variety. Additional trees of each selection were planted in guard plots. From the 2002 crop onwards, data was collected from three replicates only. Fruit was thinned to singles but not spaced. Fruit was picked when easily detached from the tree, each season and the yields of fruit recorded. Fruit was sized and graded and placed in cold store. Fruit was stored in air at 3ºC and assessed at monthly intervals for quality attributes using the EUFRIN fruit quality protocol (Appendix1). Where the volume of fruit after grading was limited fruit was stored to the most appropriate period. To help direct comparison of variety performance a selection index (0 - 30) was calculated for each cultivar taking account of fruit quality, size and total yield (Appendix 2). Cultivars were then ranked from 1 to 8 according to the selection index.

Results

Trees established well following initial pruning and carried their first crop in 1999.

Table 8a: Apple Variety Trial 40 Total Yield (kg/tree) of fruit 1999-2003– planted March 1998

Variety	1999	2000	2001	2002	2003	Total
E277-55	3.47	7.23	6.13	15.00	10.80	42.70
E288-3	3.36	0.44	9.76	-	18.00	-
E303-15	0.37	3.97	8.93	11.50	16.90	41.60
E305-3	1.10	5.50	15.61	10.30	19.70	52.20
Jonagold	4.03	9.87	19.67	18.80	23.10	75.50
Queen Cox	1.23	4.13	5.23	9.20	8.40	28.20
Royal Gala	1.83	3.62	7.73	11.00	10.90	35.10
Smoothee	3.07	8.87	11.10	19.80	5.30	48.10
Significance	0.018	0.039	0.018	0.157	0.012	0.001
	(13 df)	(12 df)	(11 df)	(9 df)	(11 df)	(12 df)
SED	0.974	2.462	3.406	4.20	4.03	7.71
CV (%)	51.7	55.3	39.6	37.6	34.9	20.4

Results were analysed for the three replicate plots from which yield were taken for the full five years. Where there was a missing value for the data in a particular year, a figure was estimated using the yields obtained from the other replicate plots of that variety. These values were then included when calculating the total yield over the five years for each plot. No yield data were available from E288-3 in 2002. There are statistically significant differences in yield between varieties, at the 95% probability level, where the significance value shown for a column is less than 0.05.

Table 8b: Apple Variety Trial 40 Yield (kg/tree) of marketable fruit 1999-2003

– planted March 1998

Variety	1999 ***	2000	2001	2002	2003	Total
E277-55	3.5	6.9	5.7	14.2	9.3	39.1
E288-3	3.4	0.4	8.8	-	15.4	28.0
E303-15	0.4	3.4	8.6	10.5	15.0	37.9
E305-3	1.1	4.8	14.5	9.3	18.1	47.8
Jonagold	4.0	9.2	18.4	17.1	20.4	69.1
Queen Cox	1.2	3.8	4.7	7.8	6.4	23.9
Royal Gala	1.8	3.5	7.3	10.7	10.7	34.0
Smoothee	3.1	8.3	10.6	18.8	4.4	45.2

***Insufficient fruit to grade in 1999.

No variety exceeded the yield potential of Jonagold although all test varieties exceeded that of Cox. The yield of E277-55, E303-15 and E305-3 was comparable to Royal Gala and Smoothee.

Table 9: Apple Variety Trial 40 Fruit size and quality - year 2003

Variety	Fruit Size (% Class1 & 2)						Quality (%)		
	<60	65.0	70.0	75.0	80	>85mm	Class1	Class2	Other
E277-55	8.8	10.9	27.0	25.5	8.5	5.5	71.8	14.2	13.9
E288-3	35.5	35.7	13.0	1.4	0.0	0.0	59.6	26.0	14.4
E303-15	40.6	21.5	17.8	6.9	2.2	0.0	64.5	24.5	11.0
E305-3	35.1	43.1	12.7	1.2	0.0	0.0	62.5	29.5	8.0
Jonagold	4.2	13.6	24.7	22.1	14.0	9.6	64.5	23.7	11.7
Queen Cox	25.0	34.2	8.8	6.7	1.7	0.0	53.8	22.5	23.8
Royal Gala	32.6	45.9	15.8	3.8	0.0	0.0	82.3	15.8	1.9
Smoothee	7.1	7.7	26.8	30.4	7.1	3.6	72.0	10.7	17.3

Down grading of Cox was due to poor colour and russet. Jonagold and E288-3 had down grading due to sawfly damage and in the case of E228-3 russet. Lack of colour was the cause of down grading in other varieties. Heavier thinning to varieties would have improved fruit size but pruning system with some summer pruning would be required to improve colour development.

The development of a selection index was driven by the desire to see if comparison of varieties could be facilitated by producing one indicator of measurable performance. The index developed (Appendix 2) achieves this to some extent, enabling attention to be focussed on those varieties which stand out from the rest. Key factors missing from this index are taste and visual appearance, which are crucial in the market.

Table 10: Apple Variety Trial 40 Selection index 2003

Variety	Quality Class1	Size %≥70	Yield 2003	Selection Index	Rank by Index
E277-55	71.8	66.4	10.8	15.0	**3**
E288-3	59.6	14.4	14.6	10.8	**6**
E303-15	64.5	26.8	16.9	15.4	**2**
E305-3	62.5	13.9	16.9	12.9	**4**
Jonagold	64.5	70.5	23.1	31.2	**1**
Queen Cox	53.8	17.1	8.4	6.0	**8**
Royal Gala	82.3	19.6	12.5	12.7	**5**
Smoothee	72.0	67.9	5.3	7.4	**7**

N.B. Total Yield used as a measure of the yield potential of varieties.

Whilst Jonagold had the highest selection index both E303-15 and E277-55 performed well. E277-55 does not have fruit of particularly attractive appearance but E305-3 is attractive but may not be sufficiently different from existing varieties to be useful to growers.

Most varieties in this trial are harvested over the mid season period with E288-3 just before and E277-55, E303-15 and E305-3 just after Cox. The numbered varieties in this trial, all from HRI East Malling breeding programme, are predominantly bicoloured apples.

Table 11: Apple Variety Trial 40 Mean Harvest Dates

Variety	Pick Date
E277-55	24 Sept
E288-3	11 Sept
E303-15	30 Sept
E305-3	23 Sept
Jonagold	8 Oct
Queen Cox	17 Sept
Royal Gala	22 Sept
Smoothee	9 Oct

Table 12: Apple Variety Trial 40 - Storage assessments 2002/2003

Variety	Timing	FROM STORE						AFTER 7 DAYS FROM STORE				
		TSS	Firm	Ripe	Eating	Juice	Texture	Firm	Ripe	Eating	Juice	Texture
		%	kg	Score	Score	Score	Score	kg	Score	Score	Score	Score
E 277/55	Mid Dec.	15.8	9.0	3	7	7	3	7.6	5	8	8	7
	Mid Jan.	14.4	6.8	4.5	7	8	3	6.4	5	8	8	7
	Early Feb	15.4	7.8	4.5	7	8	5	7.1	5	8	8	5
E 303/15	Mid Dec.	15.5	8.5	3	7	7	3	8.6	4	8	7	3
	Mid Jan.	15.4	8.7	3.5	7	7	3	8.3	4	7	7	4
	Early Feb	16.4	8.6	4	7	8	3	8.3	4	7	8	3
E 305/3	Mid Dec.	14.3	10.0	1	3	7	2	9.1	1	3	7	3
	Mid Jan.	13.7	8.9	3	5	7	7	8.7	4	5	7	7
	Early Feb	14.2	9.4	2	6	8	4	8.7	3	6	8	4
Jonagold	Mid Dec.	14.9	6.6	5	8	8	4	5.5	6	8	8	7
	Mid Jan.	14.3	6.4	5	8	8	8	6.0	5	8	8	7
	Early Feb	14.4	6.3	5	7	7	7	5.9	5	8	7	7
Queen Cox	Mid Dec.	15.9	6.1	6	7	7	7	5.6	6.5	7	6	8
	Mid Jan.	15.6	5.5	6	6	7	7	5.3	6.5	6	6	7
	Early Feb	14.8	5.5	5.5	7	7	7	5.0	7	6	7	7
Royal Gala	Mid Dec.	13.0	7.8	5	7	8	3	6.9	5	8	8	4
	Mid Jan.	12.6	7.5	5	7	7	3	6.4	5	8	8	5
	Early Feb	12.4	7.3	5	8	8	5	6.4	5	7.5	7.5	5
Smoothee	Mid Dec.	13.2	5.6	5	8	8	7	5.0	5.5	7	7	7
	Mid Jan.	12.7	5.5	5	7	8	7	4.8	6	7	7	7
	Early Feb	12.3	5.4	5	8	8	7	5.3	6	7	7	7

Table 13: Apple Variety Trial 40 Storage Results – 2003/04

Variety	Sample	Ex-Store						After 7days from store				
	Date	TSS %	Firm kg	Ripe Score	Taste Score	Juice Score	TexturescoreE	Firm kg	Ripe Score	Taste Score	Juice Score	Texture Score
E277/55	Mid Nov	17.5	8.7	3	5	7	3	8.3	5	7	7	6
	Early Jan	15.6	6	5	8	8	5	5.9	6	7	7	7
E288/3	Mid Nov	13.6	6.7	5	7	8	7	6.4	6	6	7	7
	Early Jan	11.4	4.8	6	6	7	7	5.3	6	6	7	7
E303/15	Mid Nov	17.1	9.3	3	5	8	3	9.3	4	6	8	3
	Early Jan	15.2	6.1	5	8	8	5	6.3	5.5	7	7	5
E305/3	Mid Nov	14.0	9.2	2	5	8	2	8.3	3	5	8	3
	Early Jan	14.4	6.5	4.5	7	8	5	6.5	5.5	7	7	7
Cox	Mid Nov	18.3	6.2	7	4	5	6	6.6	9	3	5	7
	Early Jan	14.8	5	6	5	7	7	4.8	7	4	7	7
Jonagold	Mid Nov	17.1	6.3	5	8	8	7	5.9	5.5	7	8	8
	Early Jan	15	4.9	5	8	8	7	4.4	5	8	8	7
RoyalGala	Mid Nov	14.7	8.3	4.5	8	8	3	7.4	5.5	7	8	5
	Early Jan	14.4	6	5	7	8	7	6.0	6	7	7	7
Smoothee	Mid Nov	17.7	7.7	4.5	7	7	5	6.9	5.5	7	7	7
	Early Jan	15.7	5.2	5	8	8	7	5.2	6	4	7	7

Note to Tables 12 and 13:

Fruit Quality Scores; Taste: 1 = extremely poor, 9 = excellent
Ripeness: 1 = very unripe, 9 = over-ripe
Texture: 1 = extremely coarse, 9 = extremely fine
Juiciness: 1 = very dry, 9 = very juicy

E277-55, E303-15 and E305-3 all gave good taste scores in 2003/04 although E305-3 had poor eating quality in 2002/03. The indications are that E277-55 is at its best for

eating prior to Christmas. The other EMR selections appear to have a wider marketing window. E305-3 has had consistently the best taste and fruit firmness of the four EMR selections.

Table 14: Apple Variety Trial 40 Mean Flowering Periods – 2000 to 2003

Variety	First Flower 10% Open	Full Flower 80 % Open	Flowers 90% Over
E277-55	1 May	4 May	12 May
E288-3	29 April	2 May	8 May
E303-15	26 April	26 April	4 May
E305-3	28 April	1 May	7 May
Jonagold	24 April	27 April	6 May
Queen Cox	27 April	29 April	5 May
Royal Gala	28 April	1 May	6 May
Smoothee	28 April	30 April	6 May

Variety Profiles

E277-55
Very striped colour to fruit with a light green background colour. Acceptably good yield potential and a good class 1 and size grade-out. Can be variable in eating quality. The tree tends to be a tip-bearer with fruit bud on medium to strong 1 year wood. It readily produces well angled "feathers". Later flowering than the other selections in the trial.

E288-3
A green/yellow coloured fruit with a diffuse pale red blush and somewhat flattened in shape. Flowered over the same period as the standard varieties. Disappointing yield and quality. Limited storage life. Fruit not naturally as firm as other EMR selections in this trial. Would required heavy fruitlet thinning if grown commercially. Trees have variable vigour, with growth habit somewhat like Egremont Russet, forking and with bare wood.

E303-15
Attractive pinkish, red coloured fruit. Reasonably promising yield potential. Appears to have good storage potential. Holds texture well in store and after 7 days "shelf-life". The best eating quality fruit of the four EMR selections in this trial. Would require routine fruitlet thinning in commercial orchards. Ranked well on selection index. A tip bearing tree, which will produce wide angled "feathers". Flowering season comparable to standard varieties in this trial. Wood is variable in thickness with fruit bud tending to be produced on the stronger wood

E305-3
Red coloured fruit similar in colour to Red Delicious with a waxy sheen. Can become

greasy when slightly over mature. Highest yield potential of EMR selections. Would need fruitlet thinning in production orchards. Flowering season comparable to standard varieties in this trial. Tree a tip bearing type with a profusion of fruit bud on one year wood, similar to Jonagold in this respect and in angle of "feather" production.

E277-55

E288-3

E305-3

E303-15

ROYAL GALA

SMOOTHEE

Discussion and conclusions

All the East Malling selections out performed Cox in this experiment in terms of yield

potential, but none showed as a high a yield potential as Jonagold. E303-15 appears to be the best of the EMR selections in this trial. All East Malling selections had good storage potential and shelf life following mixed variety storage in air into February. None however had any exceptional characteristics required to help a new variety to stand out in the present crowded bi-coloured apple market.

2.1.4 Apple Variety Trial 41

Materials and method

Planted in March 2000 on M9 rootstock with five single tree plots in a complete randomised block experiment. The first crop was recorded in 2002 when data from only three replicates was utilised. Fruit was thinned to singles but not spaced. Fruit was picked when easily detached from the tree, each season and the yields of fruit recorded. Fruit was sized and graded and placed in cold store. Fruit was stored in air at 3ºC and assessed at monthly intervals for quality attributes using the EUFRIN fruit quality protocol (Appendix1). Where fruit was limited in volume after grading assessments were carried out at the most appropriate period for the variety. To help direct comparison of variety performance a selection index (0 - 30) was calculated for each cultivar taking account of fruit quality, size and total yield (Appendix 2). Cultivars were then ranked from 1 to 11 according to the selection index. Marketable yield is taken to be the sum of class 1 and class 2 yield.

Results

The first crop was recorded in 2002 following successful establishment of trees. All number selections were received from the East Mallling Apple and Pear Breeding Club programme.

Table 15a: Apple Variety Trial 41 - Total Crop Yield 2002 & 2003

Variety	Total Yield		kg/tree
	2002	2003	Total
E250-3	1.3	5.3	6.6
E273-55	5.9	6.3	12.2
E303-20	8.0	18.2	26.3
E303-47	5.9	11.3	17.2
E303-71	6.5	4.2	10.6
E403-21	7.1	11.5	18.5
E409-7	10.0	17.0	27.0
Fiesta	5.3	2.6	7.9
Jonagold	10.2	18.0	28.2
Queen Cox	3.6	9.0	12.6
Royal Gala	5.5	10.1	15.6
Smoothee	10.8	7.8	18.6

Table 15b: Apple Variety Trial 41 - Marketable Crop Yield 2002 & 2003

Variety	Marketable Yield		kg/tree
	2002	2003	Total
E250-3	0.8	4.8	5.6
E273-55	4.5	5.0	9.5
E303-20	6.6	15.9	22.5
E303-47	4.7	10.5	15.2
E303-71	6.4	3.8	8.2
E403-21	5.9	10.7	16.6
E409-7	9.3	16.2	25.5
Fiesta	3.7	2.1	5.8
Jonagold	9.6	14.4	24.0
Queen Cox	3.0	7.4	10.4
Royal Gala	5.2	9.2	14.4
Smoothee	10.3	12.6	22.9

Table 16: Apple Variety Trial 41 - Fruit size & quality 2003

Variety		Fruit Size (% Class 1 & 2)						Quality (%)		
		<60	65.0	70.0	75.0	80	>85mm	Class1	Class2	Other
E250-3		41.4	26.3	17.8	5.3	0.0	0.0	60.5	30.3	9.2
E273-55		35.6	20.2	9.0	10.1	3.7	0.0	41.0	37.8	21.3
E303-20		2.1	8.5	10.8	20.1	22.9	23.1	66.5	21.0	12.5
E303-47		6.3	24.5	38.9	22.3	0.9	0.0	84.6	8.2	7.2
E303-71		52.6	26.7	10.3	1.7	0.0	0.0	69.0	22.4	8.6
E403-21		24.4	35.4	24.0	8.3	0.8	0.0	72.9	20.0	7.1
E409-7		79.2	14.8	1.4	0.0	0.0	0.0	79.5	15.9	4.7
Jonagold		1.7	9.6	24.9	27.4	14.6	1.7	55.5	24.3	20.2
Queen Cox		34.2	33.5	12.1	2.7	0.0	0.0	56.0	26.5	17.5
Royal Gala		17.7	45.4	25.7	2.0	0.0	0.0	74.3	16.5	9.2
Smoothee		52.2	26.1	2.6	1.7	2.6	0.0	60.9	24.3	14.8

Table 17: Apple Variety Trial 41 - Selection index 2003

Variety	Quality Class1	Size %70>	Yield 2003	Selection Index	Rank by Index
E250-3	60.5	23.0	5.3	4.4	**9**
E273-55	41.0	22.9	6.3	4.0	**10**
E303-20	66.5	76.9	18.2	26.1	**1**
E303-47	84.6	62.1	11.3	16.6	**3**
E303-71	69.0	12.1	4.2	3.4	**11**
E403-21	72.9	33.1	11.5	12.2	**5**
E409-7	79.5	1.4	17.0	13.7	**4**
Jonagold	55.5	68.5	18.0	22.4	**2**
Queen Cox	56.0	14.8	9.0	6.4	**7**
Royal Gala	74.3	27.7	11.4	11.6	**6**
Smoothee	60.9	7.0	7.8	5.3	**8**

N.B. Yield = Total crop yield as a measure of yield potential

Table 18: Apple Variety Trial 41 - Storage Assessments 2002/2003

Variety	Timing	FROM STORE						AFTER 7 DAYS FROM STORE				
		TSS	Firm	Ripe	Eating	Juice	Texture	Firm	Ripe	Eating	Juice	Texture

		%	Kg	Score	score	Score	Score	Kg	Score	score	Score	Score
E 250/3	Mid Dec.	18.3	11.4	3	5	4	3	9.5	3	5	5	3
E 273/55	Mid Dec.	13.9	7.6	4	7	8	3	7.1	4.5	7	8	3
	Mid Jan.	13.7	7.3	4	7	8	3	6.6	4.5	7	8	3
	Early Feb	14.6	7.5	3.5	6	7	3	7.1	4.5	7	8	3
E 303/20	Mid Dec.	15.6	6.8	5	8	8	7	5.9	6	6	6	7
	Mid Jan.	15.4	6.7	6	5	8	7	5.7	7	5	5	7
E 303/47	Mid Dec.	14.6	9.9	2.5	5	8	2	9.7	3	5	8	2
	Mid Jan.	14.7	9.7	3	5	7	2	9.5	3	6	7	2
	Early Feb	14.6	10.2	2	7	8	2	9.5	3	7	8	3
E 303/71	Mid Dec.	16.0	8.8	4.5	8	8	3	7.9	5	8	8	7
	Mid Jan.	15.7	8.1	4	7	7	3	8.3	4.5	7.5	7	5
	Early Feb	15.6	8.1	3	6	7	3	8.5	4.5	7	7	4
E 403/21	Mid Dec.	14.5	5.8	5	7	7	5	5.4	5.5	7	7	5
	Mid Jan.	15.4	5.8	5.5	7	7	7	5.2	7	7	7	7
	Early Feb	14.5	5.3	5	8	7	6	4.7	8	6	6	6
E 409/7	Mid Dec.	14.4	5.4	5	8	7	3	5.3	6	7	6	7
	Mid Jan.	15.4	5.6	5.5	8	7	7	5.5	5.5	8	7	7
	Early Feb	14.4	5.8	5	8	7	7	5.2	7	6	6	7
Fiesta	Mid Dec.	13.2	7.8	3.5	7	8	3	7.5	4.5	8	8	4
	Mid Jan.	13.6	8.3	4.5	8	8	3	7.0	5	8	8	4
Jonagold	Mid Dec.	14.7	6.0	5	8	8	4	5.7	5.5	8	8	7
	Mid Jan.	15.1	6.3	5	8	8	3	6.2	5.5	8	8	8
	Early Feb	15.0	7.0	5	8	8	7	6.4	5.5	8	8	7
Royal Gala	Mid Dec.	13.0	8.0	4	7	8	3	6.8	5.5	8	7	7
	Mid Jan.	14.0	7.5	5	7	7	7	6.9	5	7	7	7
	Early Feb	12.9	7.5	5	8	8	7	6.6	5.5	7	7	7
Smoothee	Mid Dec.	13.7	5.7	5	7	7	7	5.3	5	8	8	7
	Mid Jan.	13.2	5.3	5.5	7	7	7	5.5	6	7	7	7
	Early Feb	13.2	5.9	5	7	7	7	5.5	6	7	7	7

N.B. Fruit Quality Scores; Taste: 1 = extremely poor, 9 = excellent
Ripeness: 1 = very unripe, 9 = over-ripe
Texture: 1 = extremely coarse, 9 = extremely fine
Juiciness: 1 = very dry, 9 = very juicy

Table 19: Apple Variety Trial 41 - Storage results 2003/04

Variety	Sample Date	FROM STORE						AFTER 7 DAYS FROM STORE				
		TSS %	Firm kg	Ripe Score	Eating Score	Juice Score	Texture Score	Firm kg	Ripe Score	Eating Score	Juice Score	Texture Score
E 250/3	Mid Nov	17.8	11.9	2	5	7	1	11.0	3	5	7	3
E 273/55	Mid Nov	16.1	8.3	3	7	8	3	7.5	4	7	8	4
	Mid Dec	15.8	8.0	3	7	7	3	7.8	4.5	7	8	3
	Mid Jan	15.6	7.8	4	6	7	3	7.4	4.5	7	8	3
E 303/20	Mid Nov	17.8	7.1	5	8	8	7	5.7	6	6	6	7
	Mid Jan	17.3	7.0	6	6	8	7	5.5	7	5	5	7
E 303/47	Mid Nov	16.6	9.5	3	5	8	3	8.6	4	7	8	4
	Mid Jan	16.4	9.3	3	5	8	2	9.0	4	7	8	3
	Mid Feb	16.0	9.6	3	6	7	3	9.3	4	7	7	3
E 303/71	Mid Nov	17.8	9.0	3	6	8	4	8.4	4.5	8	8	4
	Mid Dec	17.4	8.7	4	7	7	3	8.5	5	7	7	4
	Mid Jan	17.5	8.6	4	6	7	3	8.3	5	7	7	4
E 403/21	Mid Nov	16.7	7.0	4	8	8	4	5.8	6	6	6	7
	Mid Dec	16.6	7.1	4	7	7	5	5.6	5	7	7	6
	Mid Jan	16.5	7.0	5	8	7	5	5.2	7	6	7	6

E 409/7	Mid Nov	18.1	6.6	5.5	7	6	7	6.3	7	6	6	7
	Mid Dec	18.0	6.4	5	7	7	6	6.1	7	7	6	7
	Mid Jan	18.3	6.4	5	8	7	6	6.2	8	7	6	7
Jonagold	Mid Nov	17.0	6.4	5	8	8	7	6.2	5.5	8	8	7
	Mid Dec	16.5	6.1	5	8	8	6	6.0	5.5	8	8	7
	Mid Jan	17.0	6.3	5	8	8	6	6.1	5.5	8	8	7
Queen Cox	Mid Nov	19.6	7.0	6	5	6	7	6.5	9	4	5	7
Royal Gala	Mid Nov	15.2	8.8	4	8	8	4	7.0	5.5	7	7	7
	Mid Dec	14.0	7.9	5	7	7	7	6.8	5.5	7	7	7
	Mid Jan	14.3	7.6	5	8	7	7	6.8	5.5	7	7	7
Smoothee	Mid Nov	16.9	6.7	4.5	7	8	5	6.8	6	6	7	5
	Mid Dec	16.4	6.3	5	7	7	6	6.0	6	7	7	6
	Mid Jan	16.1	6.5	5	7	7	6	5.9	6	7	7	6

N.B. Fruit Quality Scores; Taste: 1 = extremely poor, 9 = excellent
Ripeness: 1 = very unripe, 9 = over-ripe
Texture: 1 = extremely coarse, 9 = extremely fine
Juiciness: 1 = very dry, 9 = very juicy

Discussion and conclusions

Trees have grown well and the first two crops suggests some of the varieties from the East Malling breeding programme have high yield potential comparable to Jonagold but with better class 1 fruit. Fruit quality ex-store and after shelf life has also been encouraging. E303-20 produced a good selection index score but has given variable eating quality to date and looks to have a limited storage life. E303-47 yielded reasonable but again its eating quality may not prove to be acceptable but does appear to have a good storage life.

The experiment is scheduled to record five crops before assessments are fully made but preliminary assessments will be available following the third crop in 2004/05.

2.1.5 Apple Variety Trial 42

Materials and Methods

Planted in April 2001 on M9 rootstock with five single tree plots in a complete randomised block experiment. The first crop was recorded in 2002 when data from only three replicates was utilised. All number selections were received from the East Mallling Apple and Pear Breeding Club programme. Fruit was thinned to singles but not spaced. Fruit was picked when easily detached from the tree, each season and the yields of fruit recorded. Fruit was sized and graded and placed in cold store. Fruit was stored in air at 3ºC and assessed at monthly intervals for quality attributes using the EUFRIN fruit quality protocol (Appendix1). Where fruit was limited in volume after grading assessments were carried out at the most appropriate period for the variety. To help direct comparison of variety performance a selection index (0 - 30) was calculated for each cultivar taking account of fruit quality, size and total yield (Appendix 2). Cultivars were then ranked from 1 to 12 according to the selection index. Marketable yield is taken to be the sum of class 1 and class 2 yield

Results

Fruit set was variable in the spring 2002 with heavy set in some cases but light in others. There was considerable variability within a variety. Trees are growing well. The first years crop from HRI East Malling varieties compared favourably with the standards. The amount of crop limited the grading and storage assessments that could be carried made. The 2003 season recorded a full crop from the experiment.

Table 20a: Apple Variety Trial 42 – Total Crop yields 2002- 2003 (planted April 2002)

Variety	Total Yield kg/tree		
	2002	2003	Total
E402-16	4.1	6.2	10.3
E403-19	2.3	4.5	6.8
E447-62	2.6	13.3	16.0
E447-79	1.9	11.4	13.3
E500-47	1.6	4.7	6.3
E505-79	2.3	2.4	4.7
E506-244	4.1	7.6	11.7
E506-312	2.1	3.0	5.1
E506-80	2.8	8.8	11.6
G1-27	0.9	4.6	5.5
Queen Cox	2.4	5.3	7.7
Royal Gala	0.9	8.8	9.7

Table 20b: Apple Variety Trial 42 – Marketable Crop yields 2002- 2003 (planted April 2002)

Variety	Marketable Yield kg/tree		
	2002	2003	Total
E402-16	3.5	4.7	8.2
E403-19	1.4	2.8	4.2
E447-62	2.5	9.4	11.9
E447-79	1.8	10.7	12.5
E500-47	1.4	3.9	5.3
E505-79	1.8	1.9	3.7
E506-244	3.5	7.1	10.6
E506-312	1.0	2.5	3.5
E506-80	1.8	8.4	10.2
G1-27	0.7	3.6	4.3
Queen Cox	2.2	4.2	6.4
Royal Gala	0.8	8.5	9.3

The marketable yield is taken as the proportion of total yield which falls in class 1 plus class 2.

Table 21: Apple Variety Trial 42 - Fruit size & quality 2003

Variety	Fruit Size (%Class 1 & 2)						Quality (%)		
	<60	65.0	70.0	75.0	80	>85mm	Class1	Class2	Other
E402-16	23.0	32.0	13.5	5.6	1.7	0.0	61.2	14.6	24.2
E403-19	3.1	11.5	16.7	17.7	9.4	3.1	22.9	38.5	38.5
E447-62	6.7	4.9	3.5	13.0	20.5	22.1	44.7	26.0	29.3
E447-79	66.4	21.2	6.1	0.5	0.0	0.0	71.5	22.6	5.8
E500-47	1.1	7.1	21.7	38.0	12.0	2.7	75.5	7.1	17.4
E505-79	30.5	28.8	18.6	3.4	0.0	0.0	61.0	20.3	18.6
E506-244	34.1	25.4	21.5	11.8	1.2	0.0	82.5	11.5	6.0
E506-312	34.2	19.7	20.2	8.3	0.0	0.0	56.0	26.4	17.6
E506-80	37.8	27.7	22.8	7.1	0.0	0.0	76.4	19.1	4.5
G1-27	37.1	34.0	6.2	0.0	0.0	0.0	54.6	22.7	22.7
Queen Cox	41.4	28.3	10.3	0.0	0.0	0.0	50.3	29.7	20.0
Royal Gala	60.0	33.5	3.5	0.0	0.0	0.0	83.1	13.8	3.1

Table 22: Apple Variety Trial 42 - Selection index 2003

Variety	Quality Class1	Size %70>	Yield 2003	Selection Index	Rank by Index
E402-16	61.2	20.8	6.2	5.1	7
E403-19	22.9	46.9	4.5	3.1	9
E447-62	44.7	59.1	13.3	13.8	1
E447-79	71.5	6.6	11.4	8.9	3
E500-47	75.5	74.5	4.7	7.1	6
E505-79	61.0	22.0	2.4	2.0	12
E506-244	82.5	34.4	7.6	8.9	3
E506-312	56.0	28.5	3.0	2.5	11
E506-80	76.4	30.0	8.8	9.4	2
G1-27	54.6	6.2	4.6	2.8	10
Queen Cox	50.3	10.3	5.3	3.2	8
Royal Gala	83.1	3.5	8.8	7.6	5

N.B. Total yield used as a measure of the yield potential of each variety.

Table 23: Apple Variety Trial 42 Storage Assessments 2002/2003

Variety	Timing	FROM STORE						AFTER 7 DAYS FROM STORE				
		TSS %	Firm kg	Ripe Score	Eating Score	Juice Score	Texture Score	Firm kg	Ripe Score	Eating Score	Juice Score	Texture Score
402/16	Mid Dec.	12.9	7.8	4.5	7	6	7	7.1	5.5	8	8	7
	Mid Jan.	12.0	7.5	5.5	7	7	7	6.9	9			
	Early Feb	12.2	7.4	9	3	7	7		9			
E 447/62	Mid Dec.	12.9	7.0	5	8	8	7	6.5	5.5	7	8	8
	Mid Jan.	13.3	7.1	4.5	8	8	4	6.3	5	8	8	7
E 447/79	Mid Dec.	14.4	8.4	4.5	7	7	7	7.8	5	8	8	7
	Mid Jan.	13.8	8.6	4	7	7	5	7.5	4	7	7	5
E 500/47	Mid Dec.	14.7	9.0	3	7	8	2	7.9	4.5	8	8	7
E 505/79	Mid Dec.	15.2	7.6	5	7	7	7	6.4	4.5	5	8	3
	Mid Jan.	12.8	6.5	5	7	8	7	6.2	5.5	7	8	7
	Early Feb	13.3	7.1	3	5	6	3	6.0	5	7	7	7
E 506/244	Mid Dec.	13.6	7.7	4	7	8	3	7.3	5	8	8	5
	Mid Jan.	13.9	7.5	4.5	7	7	5	7.4	5	8	8	7
	Early Feb	13.4	7.5	4.5	7	8	3	6.9	4.5	7	8	4
E 506/80	Mid Dec.	13.6	8.8	3	7	7	7	8.6	3	7	7	7
	Mid Jan.	13.7	8.6	3	5	7	3	8.6	3	6	7	3
E506/312	Mid Dec.	Z										
	Mid Jan.	14.4	6.9	4.5	7	7	7	6.9	5	7	7	7
Queen Cox	Mid Dec.	15.9	6.5	5.5	6.5	7	5	5.7	6	6	7	7
Royal Gala	Mid Dec.	13.6	7.9	4	8	8	3	6.8	5	8	8	7
	Mid Jan.	13.5	7.1	5	7	8	5	6.4	5	7	8	5

N.B. Fruit Quality Scores; Taste: 1 = extremely poor, 9 = excellent
Ripeness: 1 = very unripe, 9 = over-ripe
Texture: 1 = extremely coarse, 9 = extremely fine
Juiciness: 1 = very dry, 9 = very juicy

Table 24: Apple Variety trial 42 - Storage Assessments 2003/04

Variety	Timing	FROM STORE						AFTER 7 DAYS FROM STORE				
		TSS	Firm	Ripe	Eating	Juice	Texture	Firm	Ripe	Eating	Juice	Texture
		%	kg	Score	Score	Score	Score	kg	Score	Score	Score	Score
E 402/16	Mid Nov	15.3	8.2	1	3	7	3	7.1	5.5	7	7	7
	Mid Dec	13.0	7.9	3	5	7	4	7.1	8	7	7	7
	Mid Jan	12.2	7.6	4	7	7	4	6.8	8	7	7	7
	Mid Feb	12.3	7.5	6	7	7	4	6.7	8	6	7	7
E 403/19	Late Sep	14.0	6.1	8.5	3	4	8					
	Mid Nov	13.6	5.7	9	4	5	7					
E 447/62	Mid Nov	17.6	7.6	4	7	8	3	7.4	5.5	7	7	7
	Mid Dec	16.5	7.4	5	7	7	4	7.0	5	7	7	7
	Mid Jan	17.0	7.2	7	5	7	4	6.9	7	7	7	7
	Mid Feb	17.2	7.0	8	3	7	5	6.7	7	7	7	7
E 447/79	Mid Nov	18.4	8.8	4	6	7	4	8.5	4.5	8	7	4
	Mid Nov	16.0	8.5	4	7	7	5	8.0	5	7	7	6
	Mid Dec	15.1	8.6	5	7	7	5	7.4	4	7	7	6
E 500/47	Mid Nov	17.1	8.3	3	7	8	3	7.4	7	7	8	6
	Mid Dec	15.4	8.0	3	7	8	3	7.7	7	7	7	6
E 505/79	Mid Nov	16.1	7.4	5	8	8	8	7.3	5	8	8	8
	Mid Dec	15.8	7.3	5	7	8	7	7.0	5	7	7	8
	Mid Jan	14.0	7.0	6	7	7	7	6.9	6	7	7	8
	Mid Feb	14.1	6.8	5	6	6	7	6.5	5	7	7	7
E 506/244	Mid Nov	16.2	7.8	4	8	8	3	7.3	5	8	8	5
	Mid Dec	15.6	7.6	4	7	7	4	7.3	5	7	8	6
	Mid Jan	14.8	7.5	4	7	7	3	7.4	5	7	8	6
	Mid Feb	14.2	7.5	4	7	7	3	6.9	5	7	8	5
E506/312	Mid Nov	17.0	8.3	4	7	8	3	7.0	5	7	8	4
	Mid Dec	16.4	7.1	4	7	7	5	6.9	5	7	8	5
G1 - 27	Late Sep	14.3	5.4	7	3	5	7					
Queen Cox	Mid Nov	18.5	7.3	5.5	6	7	7	6.9	6.5	6	6	7
	Mid Dec	16.0	6.6	5.5	6.5	7	6	5.8	6	6	7	7
Royal Gala	Mid Nov	16.4	8.4	4	7	8	3	6.9	6	5	7	7
	Mid Dec	14.0	8.0	4	8	8	3	6.7	6	8	8	7
	Mid Jan	13.7	7.3	5	7	8	5	6.4	6	7	8	6

N.B. Fruit Quality Scores; Taste: 1 = extremely poor, 9 = excellent
Ripeness: 1 = very unripe, 9 = over-ripe
Texture: 1 = extremely coarse, 9 = extremely fine
Juiciness: 1 = very dry, 9 = very juicy

Discussion and conclusions

Trees have grown well and the first two crops suggest some of the varieties from the East Malling breeding programme have good yield potential compared to Royal Gala. Fruit quality ex-store has been disappointing from some selections, but some have given good scores for eating quality both ex-store and after shelf life.

The experiment is scheduled to be recorded for five crops before assessments are fully made but preliminary assessments will be available following the third crop in 2004/05.

2.1.6 Apple Variety Trial 43

Materials and Method

Planted in April 2002 on M9 rootstock with three single tree plots in a complete randomised block experiment. Fruit was thinned to singles but not spaced. Fruit was picked when easily detached from the tree, each season and the yields of fruit recorded. Fruit was sized and graded and placed in cold store. Fruit was stored in air at 3ºC and assessed at monthly intervals for quality attributes using the EUFRIN fruit quality protocol (Appendix1). From the 2003 crop fruit volume was limited therefore storage assessments were limited. Where fruit was limited in volume after grading assessments were carried out at the most appropriate period for the variety. To help direct comparison of variety performance a selection index (0 - 30) was calculated for each cultivar taking account of fruit quality, size and total yield (Appendix 2). Cultivars were then ranked from 1 to 8 according to the selection index. Marketable yield is taken to be the sum of class 1 and class 2 yield.

Results

Trees have established well and first crop was recorded in 2003. The numbered selections were received from the East Malling Apple and Pear Breeding Club programme.

Table 25: Apple Variety Trial 43 - Crop yields 2003

Variety	Yield 2003 (kg/tree)	
	Total	Marketable
Royal Gala	5.1	4.8
Karina	5.8	3.9
Dalijean	3.0	2.6
Inglin	2.4	1.9
Katrina	4.2	3.6
E275-14	1.9	1.9 *
E505-163	3.1	3.1
E506-336	3.3	3.1

* Too few fruit to grade

Marketable fruit is taken to be that which is in class1 plus class 2.

Table 26: Apple Variety Trial 43 - Fruit size & quality 2003

Variety	Fruit Size (% Class 1 & 2)						Quality (%)		
	<60	65.0	70.0	75.0	80	>85mm	Class1	Class2	Other
Dalijean	1.3	13.3	32.0	29.3	10.7	0.0	61.3	25.3	13.3

E275-14	**								
E505-163	4.6	31.0	47.1	17.2	0.0	0.0	87.4	12.6	0.0
E506-336	25.6	56.7	12.2	0.0	0.0	0.0	77.8	16.7	5.6
Inglin	64.7	8.8	5.9	0.0	0.0	0.0	41.2	38.2	20.6
Karina	3.4	5.1	20.9	19.8	15.3	3.4	39.5	28.2	32.2
Katrina	28.3	25.8	18.3	6.7	5.0	1.7	73.3	12.5	14.2
Royal Gala	32.4	45.3	17.3	0.0	0.0	0.0	84.9	10.1	5.0

** Insufficient fruit to grade fully.

Table 27: Apple Variety Trial 43 - Selection index 2003

Variety	Quality Class1	Size %70>	Yield 2003	Selection Index	Rank by Index
Dalijean	61.3	72.0	3.0	4.0	5
E505-163	87.4	64.4	3.1	4.7	3
E506-336	77.8	12.2	3.3	3.0	6
Inglin	41.2	5.9	2.4	1.1	7
Karina	39.5	59.3	5.8	5.8	1
Katrina	73.3	31.7	4.2	4.4	4
Royal Gala	84.9	17.3	5.1	5.2	2

N.B. Total yield used as a measure of yield potential.

Table 28: Apple Variety Trial 43 - Storage assessments 2003/04

Variety	Timing	FROM STORE						AFTER 7 DAYS FROM STORE				
		TSS	Firm	Ripe	Eating	Juice	Texture	Firm	Ripe	Eating	Juice	Texture
		%	kg	Score	Score	Score	Score	Kg	Score	Score	Score	Score
Dalijean	Mid Nov	15.3	8.0	4.5	7	7	5	6.7	6	6	7	7
E 505/163	Late Sep	15.5	9.4	3	6	6	3					
	Mid Nov	16.4	8.2	4	7	8	3	8.1	4.5	8	8	4
E 506/336	Mid Nov	16.2	8.2	4	7	8	3	7.3	4.5	8	8	5
Inglin	Late Sep	15.4	6.0	7	3	3.5	7					
	Mid Nov	14.5	5.7	7	4	5	7	4.9	9	3	5	7
Karma	Mid Nov	19.2	6.7	4.5	7	8	4	5.9	5.5	7	7	5
Katrina	Mid Nov	16.9	7.1	5	8	7	7	6.0	5.5	7	7	7
Royal Gala	Mid Nov	17.1	8.4	4	7	8	4	6.7	5.5	7	7	5

N.B. Fruit Quality Scores; Taste: 1 = extremely poor, 9 = excellent
Ripeness: 1 = very unripe, 9 = over-ripe
Texture: 1 = extremely coarse, 9 = extremely fine
Juiciness: 1 = very dry, 9 = very juicy

From the 2003 crop fruit volume was limited therefore storage assessments were limited and no late samples, after November could be assessed. Karma, Katrina, E505-163 and E506-336 gave initially promising scores for eating quality.

Discussion and conclusions

Initial results for many varieties in this trial show poorer precocity compared to the standard variety, Royal Gala, which is disappointing. With the exception of Inglin

eating quality scores have been reasonably good.

The experiment is scheduled to be recorded for five crops before assessments are fully made but preliminary assessments will be available following the third crop. Earlier termination of the trial may occur if performance of test varieties does not meet the exacting standards required by consumers.

2.1.7 Pear - Variety Trial 18

Materials and Methods

Maiden trees of six varieties on Quince A rootstock were planted in rows 4 x 1.5m apart in March 2002. Three replicates of single-tree plots were planted in a randomised block experiment. Guard trees of Beurre Hardy were planted in addition to the trial trees, which offer the opportunity to framework with any new varieties that become available for testing.

Varieties
1. Conference
2. Deloran
3. Homored
4. Anna
5. Rocha
6. P507-21

Guards: Beurre Hardy

Results Trees are establishing. No crop was produced in 2003.

3. APPENDICES

APPENDIX 1

Must put a simple explanation at end of each table as a high score does not mean a good result!

Storage and Fruit Quality Assessments

Refractometer was used for the measurement of total soluble solids as a measure of fruit sugar levels. Results expressed as a percentage.

Firmness was measured with an Effegi pentrometer using an 8mm probe for pears and 11mm probe for apples.

Eating Quality (Taste): scored on a 1 to 9 scale;
1 = extremely poor
5 = intermediate
7 = good
9 = excellent

Ripeness: scored on a 1 to 9 scale;
1 = very unripe
5 = peak ripeness
7 = just past best ripeness
9 = "over" ripe

Texture: scored on a 1 to 9 scale;
1 = extremely coarse
3 = coarse
5 = intermediate
7 = fine
9 = extremely fine

Juiciness: scored on a 1 to 9 scale
1 = very dry
3 = dry
5 = rather dry
7 = juicy
9 = very juicy

Footnotes to tables; z = no sample available
w = sample over mature

APPENDIX 2

Selection Index

We have examined a number of potential indices, which integrate a number of measurable attributes of variety performance with a view to producing a means of easily comparing varieties.

The Selection Index we are using is:

$$\text{Index} = \frac{\text{Yield x (\%Class 1 Fruit + \%Fruit over 70mm)}}{100}$$

We will however continue to explore other Indices to see if we can develop one that better reflects variety performance.

APPENDIX 3

APPLICATIONS TO HDC APPLE & PEAR VARIETY TRIALS – 2003

CATEGORY SPRAY NO	PLOT No.	APPLIED DATE	CHEMICAL	RATE	UNITS	WATER	NOTES	
FERTILISER MP	160	22-APR-03	KAY NITRO	250k				
HERBICIDE MP	160	18-FEB-03	SIMAZINE	3.0		300		
MP	160	18-FEB-03	DIURON	3.0		300		
PESTICIDE MP	160	14-FEB-03	CUPROKYLT FL	5.0	LT	1000	0.9KPH	
MP	160	03-MAR-03	RADSPOR	1.5	LT	200	3.7KPH	
MP	160	17-MAR-03	RADSPOR	1.5	LT	200	1.0KPH	
MP	160	28-MAR-03	RADSPOR	1.5 L		200L		
MP	160	08-APR-03	DITHIANON	0.6L		200L		
MP	160	08-APR-03	SYSTHANE	0.33		200L		
MP	160	15-APR-03	DURSBAN	1.0 L		200L		
MP	160	19-APR-03	SYSTHANE 20	0.33		200L		
MP	160	19-APR-03	CAPTAN	0.85		200L		
MP	160	29-APR-03	RUBIGAN	0.33		200L		
MP	160	29-APR-03	CAPTAN	1.00		200L		
MP	160	10-MAY-03	SYSTHANE	0.33		2001-		
MP	160	10-MAY-03	CAPTAN	0.85		200L		
MP	160	22-MAY-03	SYSTHANE	0.33		200L		
MP	160	22-MAY-03	CAPTAN	0.85		200L		
MP	160	30-MAY-03	NIMROD	1.1L		200L		
MP	160	30-MAY-03	CAPTAN	0.82		200L		
MP	160	31 -MAY-03	AZTEC	0.5L		1000 L		
MP	160	09-JUN-03	SYSTHANE	0.33		200L		
MP	160	09-JUN-03	CAPTAN	1.00		200L		
MP	160	17-JUN-03	DURSBAN	2.0	LT	200	0.7KPH	
MP	160	20-JUN-03	NIMROD	1.0	LT	200	0.8KPH	
MP	160	20-JUN-03	CAPTAN	1.0	KG	200	0.8KPH	
MP	160	30-JUN-03	NIMROD	1.0 L		200L		
MP	160	30-JUN-03	CAPTAN	1.OK		200L		
MP	160	15-JUL-03	SYSTHAN E 20	0.33		200L		
MP	160	15-JUL-03	CAPTAN	1.OK		200L		
MP	160	28-JUL-03	NIMROD	1.OL		200L		
MP	160	28-JUL-03	CAPTAN	1.OK		200L		
MP	160	12-AUG-03	NIMROD	1.0L		200L		
MP	160	15-AUG-03	DIMILIN FLO	0.3 L				
MP	160	24-OCT~03	CUPROKYLT	5 L		1000L		
MP	160	05-NOV-03	CUPROKYLT FLO	5 L		1000L		