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Grower Summary

Headline

- Development of core flush and flesh breakdown severely limited the storage life of E83-4 apples.

- April marketing of Meridian may be possible by using 'Cox-type' CA conditions, lower storage temperatures and SmartFresh™.

Background and expected deliverables

E83-4 is a selection raised from a cross made at EMR between T30-24 and Fiesta and has been in trial for over 10 years. E83-4 has a 1 in 4 chance of being a low ethylene producer, which would undoubtedly favour its potential as a selection with good storage characteristics. Despite being in growers' trials for the past 5 years or so there has been no decision on the future of the selection by the UK fruit industry. To aid a decision on the commercial future of E83-4, information on the likely storage period is required. The view of the HDC Tree Fruit Panel was that the likely success of E83-4 would be related partly to its ability to store until late April or early May.

Summary of the project and main conclusions

Samples of E83-4 were harvested at commercial maturity (20 September 2004) from a commercial farm in West Kent and from a trial plot at EMR. For comparison samples of Meridian were picked at the same time from 2 plots at EMR. The fruit was transported immediately to the Jim Mount Building at EMR where each consignment was randomised to form the required number of samples for storage. Half of the storage samples were treated with 'SmartFresh™' (625 ppb 1-MCP) prior to storage. Additional samples provided for an assessment of harvest maturity (internal ethylene concentration, starch pattern, firmness and soluble solids concentration). Storage samples were loaded into 6 storage containers of nominal 80-kg capacity. Storage conditions were air and CA (1.2% O_2 + <1% CO_2) at 0-0.5, 1.5-2 and 3.5-4ºC. CA conditions were established rapidly by nitrogen flushing once fruit had achieved the required temperature. Samples of fruit were removed in late January and mid April for quality measurement that included background colour (April only), firmness, soluble solids (April only) and an informal tasting. Fruits were examined for the presence of rotting and the development of physiological disorders. A further set of samples was examined after a further 7 days at 20ºC (simulated marketing period). Samples of fruit were displayed at the EMRA / MFSS Storage Day held at EMR on 5 April 2005 and comments on visual and eating quality were provided by 22 attendees.

Meridian

Meridian was included in the study as a possible contender for a marketing slot late in the season for UK-grown apples. A major disadvantage of Meridian is its naturally soft texture, which makes it difficult to market where retailers are enforcing an arbitrary firmness (penetrometer) threshold of 6.5 kg. In this trial Meridian stored well in 'Cox-type' CA conditions (<1% CO_2 + 1.2% O_2) until April even at very low storage temperatures (0-0.5^{o}C) and were free of core flush and breakdown and virtually free of bitter pit. In previous work, funded by the APRC (project SP117), Meridian stored well in 'Cox-type' CA conditions at 1.5-2^{o}C. It is known from previous work that bitter pit can be problematic in Meridian, particularly in large fruit and in fruit from young trees. Storage in CA at lower temperatures was advantageous for firmness retention as was the use of SmartFresh^{TM}. Treatment with SmartFresh^{TM} did not have any adverse effects on CA-stored Meridian apples. This contrasts with its use on Cox where storage life is shortened by aggravation of core flush and breakdown. However, it is important to remember that these results relate to only 2 orchards and one growing season. Further trials would need to be carried out to confirm that SmartFresh^{TM} can provide consistent firmness benefits without any adverse effects. Meridian apples presented at the MFSS / EMRA Storage Day were rated highly (6.8 out of 10) for appearance and eating quality. It was interesting that Meridian scored higher than E83-4 for eating quality despite being 0.7 kg softer. It is possible that Meridian could be marketed in April provided that fruit was picked at the right time (firmness 7-7.5 kg) and stored in 'Cox-type' CA at 1.5-2^{o}C. The use of SmartFresh^{TM} prior to CA storage may help to ensure that fruit meets the firmness specification.

E83-4

The development of core flush and flesh breakdown in E83-4 apples is a major factor limiting storage life and, on the basis of this preliminary trial, there is no prospect of marketing fruit in April. Unlike Meridian, E83-4 apples were very firm at harvest and maintained their firmness well during storage. More than adequate firmness was achieved through to April by the use of CA storage or by applying SmartFresh^{TM} prior to air storage. E83-4 apples achieved good scores for appearance (7.2 out of 10) and eating quality (5.8 out of 10) when assessed by attendees of the MFSS / EMRA Storage Day although one or two tasters felt that they were bland or too sweet. Unfortunately despite good acceptance on the basis of visual and eating quality the presence of core flush is a serious negative characteristic. The development of core flush and breakdown was sufficiently severe to suggest that any attempts to ameliorate the problem by optimising harvest date and storage conditions is unlikely to be successful. If E83-4 is released as a commercial mid-season variety then further work would be required to optimise its storage performance.

Financial benefits

The likely commercial success of any new selection is strongly influenced by the period of its availability. Ideally new cultivars should have sufficient storage potential to enable marketers to introduce them at the most opportune time. Marketers are conscious of the need to avoid oversupply of apples during the year and to avoid competition with more established cultivars. Financial loss can be avoided by basing a marketing plan on the likely storage performance of a variety. The indication that E83-4 has a limited storage potential will affect its commercial future. It is now up to the marketers to decide on the financial viability of releasing an apple that provides good quality over the early to mid part of the UK season.

Action points for growers

Growers need to wait for a decision by EMR and HDC on the commercial future of E83-4.

Science Section

Introduction

E83-4 is a selection raised from a cross made at EMR between T30-24 and Fiesta and has been in trial for over 10 years. E83-4 has a 1 in 4 chance of being a low ethylene producer, which would undoubtedly favour its potential as a selection with good storage characteristics. Despite being in growers' trials for the past 5 years or so there has been no decision on the future of the selection by the UK fruit industry. To aid a decision on the commercial future of E83-4, information on the likely storage period is required. This proposal was prepared in response to a request from the HDC Tree Fruit Panel for some robust storage trials to be undertaken at EMR. The view of the Panel was that the likely success of E83-4 would be related partly to its ability to store until late April or early May.

Objective

1. Overall aim of the project

   To estimate the storage potential for E83-4 apples stored in refrigerated air and controlled atmosphere (CA) conditions.

2. Specific Objectives

- To measure changes in the quality of E83-4 fruit stored in air and CA storage at various temperatures until the end of April.
- To compare the quality of E83-4 fruit with that of Meridian apples stored under the same conditions.
- To investigate the effect of 'SmartFresh^{TM}' (1-MCP) application on storage life and quality of E83-4.

Materials and Methods

Meridian and E83-4 apples were harvested on 20 September 2004 and transported immediately to the Jim Mount Building. The intention was to obtain samples of Meridian and E83-4 from a commercial site (reference CB) and from EMR. However, a decision to harvest the Meridian at the commercial site earlier than planned necessitated that two samples of Meridian were taken from orchards at EMR (plots EE and MP). The EMR sample of E83-4 was taken from plot MP. Fruit from each plot was randomised into 12 storage boxes (nominal 14 kg) and all fruit was cooled to 3^{o}C overnight. A separate sample of 12 fruits per plot was set aside for assessment of maturity. Six boxes of fruit from each plot were treated with SmartFresh^{TM} (625 ppb 1-MCP) for 24 hours. SmartFresh^{TM}-treated and untreated fruit from each plot were stored in air and controlled atmosphere (CA) conditions (<1%CO_2 + 1.2%O_2) at 0-0.5^{o}C, 1.5-2^{o}C and 3.5-4^{o}C. Storage containers were loaded on 24 September and CA conditions were established immediately by flushing with nitrogen. Samples of fruit were removed from store on 25 / 26 January and on 12 / 13 April 2005. Quality assessments were carried out on fruit immediately after removal from store and again after a further 7 days at 20^{o}C.

To assess maturity at harvest measurements were made of internal ethylene concentration (IEC), firmness, soluble solids concentration and starch pattern (see below).

Internal ethylene concentration (IEC). A sample of the internal atmosphere of undamaged apples was taken by syringe (0.5ml) and injected into a gas chromatograph fitted with an alumina column and FID detector. Results were expressed as parts per billion (ppb) of ethylene.

Fruit firmness. Two measurements were made on the opposite sides of each fruit using an LRX (Lloyd Instruments) materials testing machine fitted with an 11mm probe. Measurements were made in the equatorial region after removal of the peel. Firmness was the maximum force (N) recorded during the insertion of the probe to a depth of 8mm.

Soluble solids concentration. Juice was extracted from each apple using a 'Chylofel' (Copa - Technologie S.A.) apparatus and mixed to form a composite sample. Soluble solids concentration (%) was measured using a digital refractometer (Atago Ltd).

Starch test. Half of each apple cut for internal examination was dipped in a solution containing 0.1% w/v iodine and 4% w/v potassium iodide. Dipped sections were left for at least an hour before being assessed. Each apple was scored (1 = slight central discoloration to10 = no peripheral discoloration) using the starch conversion chart for apples (circular type) issued by Ctifl. An average score was calculated for each sample.

On removal from store in January each sample was weighed and inspected for the presence of rots and external disorders. A sub-sample of 10 fruits was taken from each of the storage samples for firmness measurement and then cut and examined for the presence of internal physiological disorders. An external and internal examination was carried out on sub-samples subjected to 7 days at 20^{o}C. A similar procedure was followed at the second examination of fruit in April but additionally the background colour (see below) and soluble solids concentration of the juice was measured.

Background colour. The colour of the non-blush side of the fruit was assessed using commercial (World Wide Fruit /Qualytech) colour charts. Background colour of each fruit was compared against 4 cards that range from green (1) to yellow (4). The average score was calculated for each sample.

Statistical analyses

All data were subjected to an analysis of variance (ANOVA). The overall effects of storage treatments can be compared using the standard errors of the difference between means (s.e.d.) and degrees of freedom (d.f.) given in the tables.

Results and Discussion

There has been no work done to identify the optimum harvest period for E83-4 whereas for Meridian it is necessary to harvest fruit before firmness declines below 7 kg (68.7 N) in order to achieve satisfactory firmness in CA-stored fruit. Internal ethylene (IEC) and soluble solids concentration and starch pattern provide no indication of when to harvest Meridian and firmness is the only important maturity criteria for determining harvest date. Fruit from plots EE and MP were close to and slightly below the 7 kg threshold suggesting that picking was slightly later than ideal. On the basis of starch loss the E83-4 fruit were more mature than the Meridian and on the basis of the IEC data the CB fruit were judged to be in an advanced stage of maturity. Typically apples are considered to be ripening when IEC exceeds 100 ppb and is on a sustained increase. The advanced stage of maturity may be explained by the very light crops of large fruit on the commercial trees.

Table 1. Maturity parameters of Meridian and E83-4 apples harvested from 2 sites on 20 September 2005.

	Plot ref.	IEC	Firmness	Sol. Solids	Starch
		(ppb)	(N)	(%)	(1,black-10,white)
Meridian	EE	23	69.2	11.9	3.6
E83-4	CB	566	87.0	12.6	5.7
Meridian	MP	29	67.6	11.9	3.5
E83-4	MP	73	80.8	11.4	4.6

January removal – immediate examination

Overall E83-4 fruit were firmer than Meridian and CA-stored fruit were firmer than air-stored fruit but store temperature did not affect firmness significantly. SmartFresh™ improved the firmness of air-stored fruit but not of CA-stored fruit (Table 2).

Meridian stored in air was very soft regardless of store temperature with an average firmness of 44.1 N (4.5 kg), which is 2 kg below the 6.5 kg firmness threshold imposed by many multiple retailers. Firmness of Meridian from CA storage was marginal. With the exception of the highest storage temperature SF-treated fruit stored in air were of similar firmness to untreated CA-stored fruit.

E83-4 apples stored in air were of marginal firmness averaging 61.5 N (6.3 kg) but air-stored fruit treated with SF (77.9 N) and CA-stored fruit with (77.3 N) and without (74.4) SF treatment were all very firm in relation to the suggested 63.8 N (6.5 kg) threshold.

Table 2. Firmness (N) of Meridian and E83-4 apples stored in air or controlled atmosphere (CA) storage until 25/26 January 2005. Fruit was or was not treated with SmartFresh^{TM}(SF) prior to storage.

Temp.	Atmosphere	Meridian		E83-4	
		No SF	SF	No SF	SF
3.5-4^{o}C	CA	63.4	63.7	70.8	79.2
	Air	42.7	54.4	62.2	76.8
1.5-2^{o}C	CA	62.3	63.9	75.5	76.8
	Air	43.1	61.4	63.2	77.9
0-0.5^{o}C	CA	62.5	61.8	77.0	75.9
	Air	46.5	62.0	59.2	79.1
SED (24 df)		3.43			

With the exception of core flush the incidence of internal disorders was very low (data not presented). Core flush affected only E83-4 fruit and was generally restricted to fruit from the commercial orchard (Table 3). There was insufficient data to allow a statistical analysis to be carried out. Core flush tended to occur least in fruit at the lowest storage temperature and tended to be aggravated by SF. Similar effects of SF on core flush have been noted previously for some other dessert cultivars such as Cox and Braeburn.

Table 3. Core flush incidence (%) in Meridian and E83-4 apples stored in air or controlled atmosphere (CA) storage until 25/26 January 2005. Fruit was or was not treated with SmartFresh^{TM}(SF) prior to storage.

Temp.	Atmosphere	Meridian		E83-4	
		No SF	SF	No SF	SF
3.5-4^{o}C	CA	0	0	0	10
	Air	0	0	15	45
1.5-2^{o}C	CA	0	0	10	15
	Air	0	0	0	0
0-0.5^{o}C	CA	0	0	0	0
	Air	0	0	0	5
SED (24 df)		Insufficient data for statistical analysis			

January removal – examination after 7 days at 20°C

Meridian apples stored in CA were slightly greasy (assessed subjectively) after 7 days at 20°C, particularly those stored at higher temperatures, but greasiness was less evident on SF-treated fruit (data not presented). Air-stored fruits were generally greasier than those stored in CA and the beneficial effect of lower storage temperatures was more pronounced (data not presented).

Firmness of both varieties held up well during a simulated marketing period with the exception of air-stored Meridian (Table 4). However, with SF treatment and low storage temperature firmness of air-stored Meridian was comparable to that of CA-stored fruit. Storage of E83-4 apples at lower temperatures retarded more effectively the subsequent softening of CA-stored fruit but had little effect on fruit that had been stored in air. Fruit treated with SF were similarly firm regardless of storage temperature or atmosphere.

Table 4. Firmness (N) of Meridian and E83-4 (plot MP only) apples stored in air or controlled atmosphere (CA) storage until 25/26 January 2005 followed by a further 7 days at 20°C. Fruit was or was not treated with SmartFresh™(SF) prior to storage.

Temp.	Atmosphere	Meridian		E83-4	
		No SF	SF	No SF	SF
3.5-4°C	CA	60.0	65.0	63.7	80.3
	Air	36.8	50.2	57.2	81.0
1.5-2°C	CA	62.5	67.1	66.2	78.7
	Air	36.7	58.5	54.9	80.7
0-0.5°C	CA	66.3	68.0	73.3	81.4
	Air	37.4	64.5	57.3	79.0
SED (12 df)		1.242		1.756	

With the exception of core flush the development of internal disorders during the simulated marketing period was minimal (data not presented). Core flush was the only disorder of commercial significance and was restricted to E83-4 fruit only. The data for E83-4 in Table 5 relates to fruit from EMR (plot MP) only. There were insufficient fruit from the commercial orchard to include in the simulated marketing tests. It was considered prudent to ensure that sufficient fruit was saved for the more significant examination in April 2005. Without orchard replication for E83-4 it was not possible to carry out a statistical analysis of the core flush data. The development of core flush may prove a serious limitation to the storage period for E83-4. Only fruit that received no SF and stored at the lowest temperature was free of the disorder. It was encouraging that there were no adverse effects of storing in CA at 0-0.5°C and more particularly no evidence of low temperature breakdown. The major benefit of SF in retarding loss of firmness was achieved at the expense of additional core flush development.

Table 5. Core flush incidence (%) in Meridian and E83-4 (plot MP only) apples stored in air or controlled atmosphere (CA) storage until 25/26 January 2005 followed by a further 7 days at 20ºC. Fruit was or was not treated with SmartFresh™(SF) prior to storage.

Temp.	Atmosphere	Meridian		E83-4	
		No SF	SF	No SF	SF
3.5-4ºC	CA	0	0	50	-
	Air	0	0	50	80
1.5-2ºC	CA	0	0	30	80
	Air	0	0	50	90
0-0.5ºC	CA	0	0	0	30
	Air	0	0	0	30
SED (24 df)		Insufficient data for statistical analysis			

- Data not reliable and therefore omitted

April removal – immediate examination

Soluble solids concentrations were higher in E83-4 (13.7%) than Meridian (13.2%) apples but there were no effects of SF or storage treatments (data not presented).

The background colour of E83-4 apples was more yellow than that of Meridian and as expected the use of CA and lower storage temperatures resulted in greater retention of greenness (Table 6). It was interesting that SF application increased the yellowness of air-stored fruit.

Table 6. Background colour (1, green – 4, yellow) of Meridian and E83-4 apples stored in air or controlled atmosphere (CA) storage until 12/13 April 2005. Fruit was or was not treated with SmartFresh™(SF) prior to storage.

Temp.	Atmosphere	Meridian		E83-4	
		No SF	SF	No SF	SF
3.5-4ºC	CA	2.55	2.20	3.10	2.90
	Air	3.50	3.70	3.90	4.00
1.5-2ºC	CA	2.10	2.15	2.80	2.95
	Air	3.00	3.65	3.55	4.00
0-0.5ºC	CA	2.25	2.10	2.90	2.70
	Air	2.60	3.25	3.50	4.00
SED (22 df)		0.2062			

E83-4 apples were firmer than Meridian and, overall, firmness was improved by lower storage temperatures and the use of CA and SF (Table 7). However, there were a number of treatment interactions. The use of SF in combination with CA ensured that firmness of Meridian apples exceeded the 6.5 kg (63.8N) threshold irrespective of storage temperature. Without SF treatment the firmness of CA-stored fruit was marginal particularly at higher storage temperatures. SF treatment markedly improved the firmness of air-stored fruit particularly at lower storage temperatures. E83-4 apples treated with SF and stored in air were firmer than those stored in CA without

SF treatment. SF-treated apples stored in air or CA were of similar firmness. Only air-stored fruit not treated with SF failed to meet the required firmness threshold.

Table 7. Firmness (N) of Meridian and E83-4 apples stored in air or controlled atmosphere (CA) storage until 12/13 April 2005. Fruit was or was not treated with SmartFresh^{TM}(SF) prior to storage.

Temp.	Atmosphere	Meridian		E83-4	
		No SF	SF	No SF	SF
3.5-4^{o}C	CA	59.1	64.4	66.4	71.2
	Air	36.4	44.8	53.2	73.0
1.5-2^{o}C	CA	62.5	64.2	69.4	77.9
	Air	37.9	57.5	52.1	77.6
0-0.5^{o}C	CA	63.6	65.0	75.5	79.4
	Air	38.6	60.7	47.5	76.7
SED (24 df)		2.59			

Core flush was not present in any of the Meridian apples examined on 12/13 April 2005 but E83-4 fruit were badly affected. Overall increasing store temperature and application of SF increased the incidence of core flush (Table 8). The severity of core flush was also worse at higher temperatures and worse in air-stored fruit (data not presented).

Table 8. Core flush incidence (%) in Meridian and E83-4 apples stored in air or controlled atmosphere (CA) storage until 12/13 April 2005. Fruit was or was not treated with SmartFresh^{TM}(SF) prior to storage.

Temp.	Atmosphere	Meridian		E83-4	
		No SF	SF	No SF	SF
3.5-4^{o}C	CA	0	0	48.1	96.6
	Air	0	0	70.9	100.0
1.5-2^{o}C	CA	0	0	55.7	48.5
	Air	0	0	47.2	75.3
0-0.5^{o}C	CA	0	0	17.1	19.4
	Air	0	0	40.9	39.1
SED (12 df)				18.25	

No flesh breakdown was recorded in Meridian apples. In contrast, E83-4 apples were affected by breakdown although the incidence was extremely variable between treatments and there were no significant treatment effects (Table 9).

Table 9. Flesh breakdown (%) of Meridian and E83-4 apples stored in air or controlled atmosphere (CA) storage until 12/13 April 2005. Fruit was or was not treated with SmartFresh™(SF) prior to storage.

Temp.	Atmosphere	Meridian		E83-4	
		No SF	SF	No SF	SF
3.5-4°C	CA	0	0	0.0	66.6
	Air	0	0	36.4	33.2
1.5-2°C	CA	0	0	7.2	0.0
	Air	0	0	35.7	3.5
0-0.5°C	CA	0	0	17.1	0.0
	Air	0	0	36.6	16.6
SED (12 df)				32.46	

Table 10. Average scores (out of 10) awarded for visual and eating quality of Meridian and E83-4 apples by 22 attendees at the MFSS / EMRA Storage Day held at EMR on 5 April 2005. Fruit not treated with SmartFresh™ had been removed from CA storage at 1.5-2°C on the previous day.

	Visual quality	Eating quality
Meridian	6.8	6.8
E83-4	7.2	5.8

April removal – examination after 7 days at 20°C

Meridian apples removed from store on 12/13 April and subjected to a further 7 days at 20°C remained free of core flush and breakdown. However, the incidence of both disorders increased in CA-stored E83-4 fruit during the simulated marketing period (Tables 11 and 12). There was insufficient fruit from the commercial orchard to provide air-stored samples for the simulated marketing period. It is therefore misleading to compare core flush and breakdown data for air-stored fruit before and after the simulated marketing period. Clearly the level of disorders in E83-4 fruit was unacceptable and there was little indication of any possible amelioration by the use of SF or by modifying the storage atmosphere or temperature.

Table 11. Core flush incidence (%) in Meridian and E83-4 apples stored in air or controlled atmosphere (CA) storage until 12/13 April 2005 followed by a further 7 days at 20°C. Fruit was or was not treated with SmartFresh™(SF) prior to storage.

Temp.	Atmosphere	Meridian		E83-4	
		No SF	SF	No SF	SF
3.5-4°C	CA	0	0	93.3	92.8
	Air	0	0	60.0	100.0
1.5-2°C	CA	0	0	80.7	82.4
	Air	0	0	76.2	85.0
0-0.5°C	CA	0	0	74.3	71.8
	Air	0	0	57.1	85.7
SED (6 df)				14.92 (CA only)	

Table 12. Flesh breakdown (N) of Meridian and E83-4 apples stored in air or controlled atmosphere (CA) storage until 12/13 April 2005 followed by a further 7 days at 20ºC. Fruit was or was not treated with SmartFresh™(SF) prior to storage.

Temp.	Atmosphere	Meridian		E83-4	
		No SF	SF	No SF	SF
3.5-4ºC	CA	0	0	34.6	89.5
	Air	0	0	15.0	10.5
1.5-2ºC	CA	0	0	28.6	58.8
	Air	0	0	9.5	0.0
0-0.5ºC	CA	0	0	37.5	38.5
	Air	0	0	0.0	14.3
SED (6 df)				43.9 (CA only)	

Conclusions

Meridian was included in the study as a possible contender for a marketing slot late in the season for UK-grown apples. A major disadvantage of Meridian is its naturally soft texture, which makes it difficult to market where retailers are enforcing an arbitrary firmness (penetrometer) threshold of 6.5 kg. In this trial Meridian stored well in 'Cox-type' CA conditions (<1% CO_2 + 1.2% O_2) until April even at very low storage temperatures (0-0.5ºC) and were free of core flush and breakdown and virtually free of bitter pit. In previous work, funded by the APRC (project SP117), Meridian stored well in 'Cox-type' CA conditions at 1.5-2ºC. It is known from previous work that bitter pit can be problematic in Meridian, particularly in large fruit and in fruit from young trees. Storage in CA at lower temperatures was advantageous for firmness retention as was the use of SmartFresh™. Treatment with SmartFresh™ did not have any adverse effects on CA-stored Meridian apples. This contrasts with its use on Cox where storage life is shortened by aggravation of core flush and breakdown. However, it is important to remember that these results relate to only 2 orchards and one growing season. Further trials would need to be carried out to confirm that SmartFresh™ can provide consistent firmness benefits without any adverse effects. Meridian apples presented at the MFSS / EMRA Storage Day held at EMR on 5 April 2005 were rated highly for appearance and eating quality. It was interesting that Meridian scored higher than E83-4 for eating quality despite being 0.7 kg softer. It is possible that Meridian could be marketed in April provided that fruit was picked at the right time (firmness 7-7.5 kg) and stored in 'Cox-type' CA at 1.5-2ºC. The use of SmartFresh™ prior to CA storage may help to ensure that fruit meets the firmness specification.

The development of core flush and flesh breakdown in E83-4 apples is a major factor limiting storage life and, on the basis of this preliminary trial, there is no prospect of marketing fruit in April. Unlike Meridian E83-4 apples were very firm at harvest and maintained their firmness well during storage. More than adequate firmness was achieved through to April by the use of CA storage or by applying SmartFresh™ prior to air storage. E83-4 apples achieved good scores for appearance and eating quality

when assessed by attendees of the MFSS / EMRA Storage Day held at EMR on 5 April 2005 although one or two tasters felt that they were bland or too sweet. Unfortunately despite good acceptance on the basis of visual and eating quality the presence of core flush is a serious negative characteristic. The development of core flush and breakdown was sufficiently severe to suggest that any attempts to ameliorate the problem by optimising harvest date and storage conditions is unlikely to be successful. If E83-4 is released as a commercial mid-season variety then further work would be required to optimise its storage performance.

Technology transfer

Demonstration and tasting of fruit at the MFFS / EMRA Storage Day held at EMR on 5 April 2005.

References

None