

POSSIBLE ALTERNATIVES FOR INCREASING INTENSIFICATION

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1] ADAS Cider Orchard Trial for NACM [Rosemaund 1993-98]

To compare Browns Apple on MM106 and Ellis Bitter on M26 with and without a 20cm interstem of Golden Delicious.

Despite restrictive ground treatments over the trial site, trees with interstems were larger and more vigorous, often producing long lengths of bare wood and the biggest annual increase in trunk girth. Ellis Bitter + interstem tree girth was 32% more and the trees 11% higher than Ellis on M26 without an interstem. The Browns Apple were slightly less vigorous.

This extra vigour had a marked effect on the crop, reducing the yield of the Browns Apple by about 5% and the Ellis by about 10% over the 4 years of recording. [This invigoration was noted in the EMR interstock trials [1972] where a short interstock [2"] with vigour in excess of the rootstock was used. The longer interstocks [14"] reduced vigour by about 30%.]

Cropping record for years 3 – 6 [Tonnes/ha]

| | 1995 | 1996 | 1997 | 1998 | Total |
|--------------------------|------|-------|-------|-------|-------|
| Browns Apple | 4.82 | 6.29 | 36.48 | 8.22 | 53.80 |
| Browns Apple + interstem | 4.12 | 5.47 | 37.30 | 7.90 | 54.78 |
| Ellis Bitter | 2.60 | 9.37 | 20.24 | 12.70 | 44.91 |
| Ellis Bitter + interstem | 1.57 | 10.45 | 18.26 | 13.07 | 43.35 |

2] ADAS INTERSTEM TRIAL FOR CIDER APPLES [Rosemaund 1993-2001]

[NACM Technical Report 15. Copas 2001]

Summary

This trial of Browns Apple and Ashton Bitter worked on combinations of 4 rootstocks and 3 interstems was planted in 1993. Two years' crop records from 1999 and 2000 showed a substantial rise and indicated that crops are still increasing. The average yield of all the combinations of Browns Apple over the 2 years was 19.8 t/ha and the Ashton Bitter, 12.5 t/ha.

Trees on M26 were mostly small and yielded poorly. MM111 produced the largest trees which cropped slightly better but were often too vigorous and biennial. MM106

was the best rootstock, outcropping all, but M25 equalled this performance in the final year.

Trees with a Golden Delicious interstem yielded poorly but increased their crops by 50% in the second year. These trees were too small for normal requirements but might be suited to highly intensive planting. Bulmers Norman interstem made the largest trees which were often biennial. Worcester Pearmain was clearly the best interstem. The best overall combination for either cider variety was Worcester Pearmain interstem on MM106.

Trial details

Trees were planted 30th March 1993 at 3.0m apart and 4.5m between the rows.

Varieties Ashton Bitter and Browns Apple

Rootstocks Weakest to strongest; M26, MM106, MM111 and M25

Interstems Weakest to strongest; Golden Delicious, Worcester Pearmain and Bulmers Norman.

Results Table 2.1 Effect of interstem on yield [tonnes/ha]

| Interstem | 1999 | | 2000 | | 1999/00 |
|--------------------|---------------|--------------|---------------|--------------|----------------|
| | Ashton Bitter | Browns Apple | Ashton Bitter | Browns Apple | Both varieties |
| Bulmers Norman | 7.00 | 8.03 | 21.1 | 37.0 | 36.57 |
| Golden Delicious | 7.21 | 10.57 | 10.6 | 16.1 | 22.21 |
| Worcester Pearmain | 9.96 | 12.81 | 19.1 | 34.4 | 38.15 |
| Mean yield | 8.06 | 9.26 | 16.93 | 29.16 | 96.93 |

Table 2.2 Effect of interstem plus rootstock on yield of Ashton Bitter [tonnes/ha]

| Interstem | Rootstock | 1999 | 2000 | 1999+2000 | Bienniality |
|--------------------|--------------|--------------|--------------|----------------|-------------|
| Bulmers Norman | M26 | 4.28 | 16.82 | 21.1 | 0.59 |
| | MM106 | 11.71 | 19.77 | ✓ 31.48 | 0.26 |
| | MM111 | 5.99 | 15.97 | 21.96 | 0.45 |
| | M25 | 6.02 | 32.92 | 38.94 | 0.69 |
| Golden Delicious | M26 | 6.28 | 7.24 | 13.52 | 0.07 |
| | MM106 | 11.34 | 14.10 | 25.44 | 0.11 |
| | MM111 | 3.80 | 7.30 | 11.10 | 0.32 |
| | M25 | 7.44 | 13.65 | ✓ 21.09 | 0.29 |
| Worcester Pearmain | M26 | 10.26 | 3.68 | 13.94 | 0.74 |
| | MM106 | 11.49 | 27.55 | ✓ 39.04 | 0.41 |
| | MM111 | 9.61 | 12.16 | 21.77 | 0.53 |
| | M25 | 8.50 | 26.57 | 35.07 | 0.52 |

Table 2.3 Effect of interstem plus rootstock on yield of Browns Apple [Tonnes/ha]

| Interstem | Rootstock | 1999 | 2000 | 1999+2000 | Bienniality |
|--------------------|--------------|--------------|--------------|----------------|-------------|
| Bulmers Norman | M26 | 7.18 | 28.84 | 36.02 | 0.55 |
| | MM106 | 7.05 | 45.37 | 52.42 | 0.73 |
| | MM111 | 10.63 | 29.94 | 40.57 | 0.48 |
| | M25 | 7.25 | 46.87 | 54.12 | 0.73 |
| Golden Delicious | M26 | 12.59 | 13.65 | 26.24 | 0.04 |
| | MM106 | 12.06 | 21.51 | ✓ 33.57 | 0.28 |
| | MM111 | 9.70 | 13.07 | 22.77 | 0.15 |
| | M25 | 7.91 | 14.78 | 22.69 | 0.30 |
| Worcester Pearmain | M26 | 9.66 | 21.13 | 30.79 | 0.37 |
| | MM106 | 17.97 | 34.87 | ✓ 52.84 | 0.32 |
| | MM111 | 12.02 | 25.22 | 37.24 | 0.35 |
| | M25 | 11.58 | 47.04 | 58.62 | 0.61 |

2.4 Visual assessment of Rosemaund trees in year 8

Browns Apple + Golden Delicious interstem

- M26 Small weak trees
- MM106 Good trees with lightweight laterals carrying a light crop of large fruit. Possibly annual.**
- M25 Too strong but with a good leader and good lightweight lateral. Crops light.
- MM111 Good growth but with light crops.

Browns Apple + Bulmers Norman interstem

- M26 Very small unstable trees with drooping branches. Over-cropping.
- MM106 Rather upright and strong. Good crops, possibly annual.
- M25 Strange upright trees, far too vigorous, mostly off.
- MM111 Vigorous and upright. A good shape but probably biennial.

Browns Apple + Worcester Pearmain interstem

- M26 A fair tree with a good shape but light crops.
- MM106 Nice looking trees with good crops, probably annual.
- M25 Very nice small trees with good crops but possibly biennial.
- MM111 Trees variable, some off some on. Rather vigorous and upright.

Ashton Bitter + Golden Delicious interstem

- M26 Poor weak trees, mostly off.
- MM106 Very biennial.
- M25 Good trees with strong leaders but rather light crops.**
- MM111 Poor trees.

Ashton Bitter + Bulmers Norman interstem

- M26 Small trees with heavy crops, definitely biennial.
- MM106 Strong trees with good leaders but over-cropping and probably biennial.
- M25 Fair trees with strong leaders and mostly good crops.
- MM111 Good strong leaders and a fair tree shape but possibly biennial.

Ashton Bitter + Worcester Pearmain interstem

| | |
|--------------|--|
| M26 | Small trees, very biennial. |
| MM106 | Rather variable trees with whippy growth and bare wood. |
| M25 | Trees with weak leaders, over-cropping and running out of steam. |
| MM111 | Fairly good trees and leaders but biennial. |

Conclusions

Ashton Bitter The best looking trees were those on MM106 and Bulmers Norman interstems; very good, strong growing with a good leader and carrying a heavy crop. Those on MM106 with a Worcester Pearmain interstem were good but rather variable, sometimes with rather whippy growth and bare wood. **Those on M25 with Golden Delicious were small trees but with good shape and good crops. These might be suitable for more intensive planting.**

Browns Apple The best looking trees were those on MM106 and a Worcester Pearmain interstem. Crops were good and looked annual. These were nice looking trees for a Browns Apple. **Also suitable for more intensive planting, Browns Apple on MM106 but with Golden Delicious interstem were very good trees with lightweight laterals. These were carrying a light crop of large fruit and appeared to be annual.** Browns Apple on Bulmers Norman and MM111 were a good shape but possibly too vigorous and more suited to a poorer site.

3] INTERSTOCKS AT EAST MALLINGEast Malling trials [EMRS Report 1992] of interstocks for Cox on MM106

All interstocks reduced tree vigour, and all except Bud 9 increased cropping efficiency but reduced fruit quality slightly .

Figures below are given as percentage % of control trees with MM106 interstocks.

| Interstock | Total shoot growth in 5 years [m] | Total yield in 3 years [kg] |
|---------------|-----------------------------------|-----------------------------|
| P2 | 37 | 75 |
| P22 | 34 | 57 |
| Bud 9 | 60 | 41 |
| MARK | 61 | 81 |
| EMLA 9 | 64 | 92 |
| Nicolai 29 | 48 | 111 |
| MM106 | 100 | 100 |

4] ROOTSTOCKS MORE DWARFING THAN MM106

| | |
|------|--|
| P22 | Very dwarfing. Similar to M27. Suckers badly |
| P2 | Very dwarfing. Intermediate between M27 and M9 |
| B9 | Very dwarfing. Slightly less vigorous than M9, but can be nearer M26 on good soils. Strong resistance to collar rot. |
| MARK | Similar to M9 but easier to propagate and better anchored. Some incompatibility noted with triploid varieties. |
| M26 | Between M9 and MM106 depending on soil and cv. Occasional incompatibility noted, eg Browns Apple sensitive to heavy shaking. |
| M116 | Gives similar trees to MM106 but better tolerance to collar rot, mildew, woolly aphid and ARD |

86-1-24 From same breeding program as M116. Slightly more dwarfing than M26 but highly susceptible to collar rot.

5] FIELD FARM ROOTSTOCK TRIAL

Girth of 10yr old trees as % of MM106 girths

Girths measured 50cm above ground

| Cv. | MM111 | M7 | M26 | M9 | M25 |
|-------------|-------|----|-----|----|-----|
| Michelin | 102 | 87 | 69 | 50 | 78 |
| Dabinett | 104 | 87 | 85 | 52 | - |
| Somerset RS | 112 | 98 | 90 | 55 | - |
| Yarlington | 108 | 89 | 81 | 51 | - |

| | | | | | |
|--------------|-----|----|----|----|---|
| Mean 15 cvs. | 104 | 94 | 80 | 54 | - |
|--------------|-----|----|----|----|---|

15 varieties on MM106, MM111, M7, M26 & M9

6] ROOTSTOCKS AS CIDER VARIETIES

[LARS Copas 1998 & Woods 197?]

Most rootstocks have been selected for ease of propagation on stool beds. This is the cheapest, easiest and quickest method of producing rooted material and could be a very economical means of propagating trees for orchard use.

A number of rootstocks, many of which originated from cider gene sources, have a suitable taste for cider or juice making, ranging from full bittersweets to pure sharps. The four below have been selected from a broad range of rootstocks for having reasonable tree habit, suitable vigour and good fruit size and cropping records.

For full collated information on a range of rootstocks, please see NACM Report 12, *Rootstocks and their potential as cider varieties*.

Bittersweet

Rootstock 3438 seems to be **by far the best**, a bittersweet with a good fruity taste and medium tannin. Its fruit is a good size, a waxy yellow colour and matures in early October. The tree vigour is moderate, the habit good if rather spreading. It propagates easily from stool beds.

M26 is also a good bittersweet with full hard tannin. The fruit matures in early October, is yellow and a good size. M26 is quite a weak tree but its habit is good and it is easy to propagate.

Juice varieties

MM106 is a mild sharp. The fruit is a good size although rather poor textured and it is mature in October. The tree is fairly vigorous, its habit is good, it is easy to propagate and it crops well.

M793 is a mild sharp which matures in October. The tree is moderately vigorous but is reported to have a rather poor habit. It is fully resistant to mildew and has some crown rot resistance.

7] SUGGESTED TRIAL DESIGN AND LAY-OUT FOR HEDGEROW ORCHARD

Objectives

- Produce a hedgerow orchard, suited to up-and-over spraying, shake and catch harvesting
- Maturing September – [early] October
- Producing >20 t/acre cider fruit
- Low input, minimal training and maintenance
- Standard stakes and wires only

Lay out

Maximum of 6 treatment combinations

A single row of each replicated as much as space allows

Planted 5' in the rows x 15- 18' between the rows.

Treatments 3 & 4 to be planted in pairs for ease of harvesting and rows of early maturing varieties to be randomised in blocks.

Treatment combinations

- 1] Prince William on M116
- 2] Lizzy on M116
- 3] Rootstock 3438 on own roots
- 4] Rootstock M26 on own roots
- 5] Michelin on MM106 or M116 with interstem Golden Delicious or Worcester
- 6] Dabinett on M25, MM106 or M116 with interstem Golden Delicious or Worcester

Records needed

Annual growth

- Girth of trunk at 50 cm above ground
- Height, of leader
- Assessment of habit
- Assessment of pruning/training requirements

Assessment of cropping

- Individual trees scored from 1 – 3 each summer
- Total yield of replicate rows

Assessment of P& D problems