

## ADAS INTERSTEM TRIAL FOR CIDER APPLES

### 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 tp ha and the Ashton Bitter, 12.5 tp 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.

### Introduction

An interstem is only a short piece of another variety budded first onto the rootstock before the variety of choice, creating a short insert of about 25 cm, but it can have a major influence on the behaviour of the tree.

A replicated cider orchard trial was planted by ADAS, Rosemaund in 1993 with the aim of finding the best combination of rootstock and interstem for improving the anchorage of Browns Apple whilst moderating its vigour and upright habit; and the best combination for increasing the strength of the centre leader in Ashton Bitter. The paramount objective was to get the best and most regular crops by minimising the inherent biennial cropping tendencies of both varieties.

Crop records only were made in years 7 and 8. This report interprets these records from the ADAS Report made for the NACM and describes the tree habit and orchard suitability of each tree/interstem/rootstock combination.

### Trial details

Trees were planted 30<sup>th</sup> March 1993 at 3.0m apart and 4.5m between the rows, with a 1.0m herbicide strip in the row.

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.

Trials design Four replicate blocks of 7 tree plots of 12 variables for each variety in a randomised design. There were no control trees without interstems.

Assessments All fruit was picked by hand in October 1999 and 2000. A visual assessment of each variety and rootstock/interstem combination was made in October 2000.

### Orchard management

Standard orchard practice; fungicide and insecticide sprays, residual and contact herbicide. Fertilizer applied annually. 2% of the trees died from crown rot which was randomly scattered in wetter spots. Yields have been adjusted accordingly.

## Results

Table 1 Effect of interstem on yield [tonnes/ha]

Interstem	1999		2000		1999/00
	Ashton Bitter	Browns Apple	Ashton Bitter	Browns Apple	
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

In 1999 the yield of both varieties with a Worcester Pearmain interstem was 30% higher than with Bulmers Norman and over 20% higher than with Golden Delicious. In 2000 the yield of both varieties with Golden Delicious was about half that with the other two interstems. Yields from the Bulmers Norman interstem were about 10% higher than from the Worcester Pearmain interstem.

Between 1999 and 2000 the yield with Golden Delicious interstems only increased by 50%, the Worcester Pearmain by 2.34 times and those with the Bulmers Norman, by 3.86 times. The increases in yields from 1999 to 2000, of Ashton Bitter were all slightly lower than those of the Browns Apple.

Table 2 Effect of rootstock on yield [tonnes/ha]

Rootstock	1999		2000		1999/00
	Ashton Bitter	Browns Apple	Ashton Bitter	Browns Apple	
M26	6.94	9.81	8.4	19.8	22.44
MM106	11.51	12.36	23.2	34.9	40.95
MM111	6.47	10.78	11.6	25.7	27.28
M25	7.32	8.91	24.6	36.3	38.55

The trees on MM106 gave the highest yields in 1999, between 15 and 75% better than the other rootstocks. The effect was most marked on Ashton Bitter where yields on MM106 were between 55 and 75% higher than other rootstocks. In 2000 yields from trees on M25 were similar to MM106. This may have been because trees on M25 rootstock made substantially more vegetative growth prior to that year. In 2000 trees on M26 were still very small and produced comparatively low yields. Although the MM111 trees were much larger, their yield was only slightly higher and was well below that from MM106 and M25.

Table 3 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
	<b>MM106</b>	<b>11.71</b>	<b>19.77</b>	✓ <b>31.48</b>	<b>0.26</b>
	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
	<b>M25</b>	<b>7.44</b>	<b>13.65</b>	✓ <b>21.09</b>	<b>0.29</b>
Worcester Pearmain	M26	10.26	3.68	13.94	0.74
	<b>MM106</b>	<b>11.49</b>	<b>27.55</b>	✓ <b>39.04</b>	<b>0.41</b>
	MM111	9.61	12.16	21.77	0.53
	M25	8.50	26.57	35.07	0.52

Although in both years there was considerable variation in the yields of Ashton Bitter treatments, MM106 was consistently better. Some of the combinations were beginning to show a marked biennial cropping pattern [Table 3 column 6]. This is illustrated by the differences in the Bienniality Index [Difference between two years' crops /sum of those crops]. A low Index indicates an annual cropping pattern and a high Index indicated strong bienniality. The best combinations with Ashton Bitter for yield and regularity were first Worcester Pearmain and second Bulmers Norman interstems on MM106 and Golden Delicious on M25.

Table 5 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
	<b>MM111</b>	<b>10.63</b>	<b>29.94</b>	<b>40.57</b>	<b>0.48</b>
	M25	7.25	46.87	54.12	0.73
Golden Delicious	M26	12.59	13.65	26.24	0.04
	<b>MM106</b>	<b>12.06</b>	<b>21.51</b>	✓ <b>33.57</b>	<b>0.28</b>
	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
	<b>MM106</b>	<b>17.97</b>	<b>34.87</b>	✓ <b>52.84</b>	<b>0.32</b>
	MM111	12.02	25.22	37.24	0.35
	M25	11.58	47.04	58.62	0.61

Again the best cropping, most regular combinations with Browns Apple were on MM106, with either Golden Delicious or Worcester Pearmain interstems. Trees with Bulmers Norman on MM106 were too biennial.

**Visual assessment of 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**

The best looking Ashton Bitter 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.

The best looking Browns Apple 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.

Liz Copas  
National Association of Cider Makers  
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