Effect of picking date and carbaryl thinning sprays on long term cropping of Michelin and Dabinett at Luddington EHS

Abstract

Mature trees of Michelin and Dabinett were picked at 2 stages of ripeness. Early harvested Michelin trees cropped more heavily and regularly over 5 years. fruit numbers on late harvested trees fluctuated more from year to year. Harvesting Dabinett whilst still immature accentuated biennial cropping. Fruit size and weight was consistently more from late harvested trees of both cultivars, but after 5 years, cumulative yields were almost identical.

Fruitlet thinning sprays reduced fruit numbers in most years but only significantly in naturally 'on' years. Increases in fruit size of both cultivars compensated for reduced numbers and cumulative yields were not significantly different from unthinned trees. All trees developed a biennial cropping pattern throughout the trial but thinned trees of both cultivars remained much more annual.

Juice sugar levels from ripe samples varied from 12 – 18% sucrose from season to season. Speed of fruit ripening also varied with season and with crop load. Variations in juice sugar from the effects of treatments were smaller than variations due to seasonal differences.

Trial A: Mature Michelin and Dabinett [Luddington EHS]

Trees were planted in 1976 on MM106 at 5.5 x 3.7m [18 x 12] in alternate rows of Michelin and Dabinett. Crops were still increasing when the trial began in 1985, with little indication of bienniality. The orchard was divided into 14 random blocks of 5 trees [2 guard trees] of each cultivar, six replicate blocks of sprayed trees and eight blocks of unsprayed control trees.

A thinning spray of 2.5 $kgha^{-1}$ carbaryl plus 125g 18% NAA [equivalent to 20 mgl^{-1}] was applied annually at petal-fall in 1000 litres water/ha using an airblast sprayer with tractor mounted screen to shield adjacent rows.

Fruit was harvested from the same trees from 1986 – 90, on one of two picking dates approximately 4 weeks apart for each cultivar:

Michelin: early pick 2^{nd} – 3^{rd} week September; late pick 2^{nd} – 3^{rd} week October.

Dabinett: early pick last week September – early October; late pick at end of October.

Fruit was weighed from five tree blocks and size graded from 50 fruit samples.

Juice was extracted in a food liquidizer and deep frozen for storage. Juice specific gravity [SG, ^{o}Brix] was measured with a hydrometer, and sugar content estimated as percentage sucrose equivalent [% sucrose] using a pocket refractometer, from thawed samples one month later

Yield and fruit number data was analysed for each year individually as a 2 x 2 factorial trial design. To allow for any biennial fluctuations in cropping, figures from two pairs of years [1986 and 1987, and 1988 and 1989] were totalled before analysis. The bienniality index [BI] for each pair of years and the duration of the trial was calculated:- $BI = \frac{\sum \text{difference between successive crops}}{\sum \text{of total yields}}$

This index is near zero for annually cropping trees and increases towards 1.0 with increasingly biennial cropping.

Effects on cropping

a] Michelin, picked early or at natural maturity

As Table 1a shows, early picked Michelin trees gave consistently more fruit in regular numbers over five years, 1986 – 90 [P = <0.05]. The difference in numbers was greatest in 1989 when late harvested trees were distinctly 'off'. Numbers of fruit fluctuated more from year to year on these trees, as indicated by the higher BI [Table 3]. Since no blossom or fruit set records were made it is not known whether these effects were due to fewer buds being produced or weaker buds leading to a poorer set.

Fruit size and weight was consistently greater from late harvested trees and although they carried fewer fruit, yields were consistently, but not significantly, more than early harvested trees in the first three years [Table 2a]. In the 'off' year 1989, yields from both early and late picked trees were lower than 1988 or 1990, but early picking effectively reduced bienniality by producing 64% more fruit and a significantly heavier crop than late picking in that year. However, after four years, the cumulative yields from both picking dates were similar[Table 2a].

b] Michelin, effect of fruitlet thinning

Table 1 shows that thinning sprays reduced fruit numbers each year except 1989. the thinning effect was much more marked in the naturally 'on' years 1988 and 1990 [P = <0.01]. Fruit from thinned trees was consistently larger and heavier which partly compensated for the thinning effect. There were no significant differences in the cumulative yields over four years.

From experience with this cultivar in commercial orchards, Michelin is expected to crop more regularly than most, but with an increasing biennial trend as trees reach maturity. In this trial, crops from all treatments, although fairly regular, did become more biennial throughout the trial [Table 3] but both the carbaryl thinning treatment and early harvesting had an ameliorating effect on this trend. By 1990 when the tress were in their 14th year, early picked and/or thinned Michelin were most annual, and late picked and/or thinned trees had developed a pronounced biennial trend.

c] Dabinett, picked early or at natural maturity

Unlike Michelin, early picking of this cultivar accentuated the biennial fluctuation of fruit numbers. In each 'on' year early picked trees carried significantly more but smaller fruit [Table 1b]. But yields from both picking dates were very similar each year, giving almost identical cumulative yields after five years [Table 2b]. The only change in yield was in 1987, the second year of recording when early picked trees yielded 32% less from exceptionally low numbers of fruit. All Dabinett trees, especially those harvested early, had carried exceptionally high numbers of fruit the year before in 1986, which took longer than usual to mature. Mean sugar level of their juice was low, only 10.6% compared with an overall average for early picked fruit if 12.8%. Excessive shaking was required to remove some of the fruit at the early harvesting date. This caused some spur damage that may have contributed to the lighter crop in the following year. In 1988, higher juice sugar levels indicated a naturally earlier maturity and consequently fruit was easier to remove at the early picking date without spur damage. The following generally 'off' year, these same trees had significantly more fruit and a slightly higher yield.

It would seem from this trial that early removal of the competitive effect of fruit, especially at a premature stage, has a large effect on the flower bud development of

this naturally annual cultivar, sufficient to encourage a fruit set beyond the optimum in the following year. Early picking unthinned trees accentuated the biennial trend even more [Table 3].

d] Dabinett, effect of fruitlet thinning

In naturally 'on' years [1986, 88 and 90] thinning had a large effect on Dabinett fruit numbers [P = <0.001] but no consistent effect on 'off' year numbers [Table 1b]. Over five years, the total fruit number [calculated] from thinned trees was much less that from unthinned [P = <0.01]. Although increased fruit size compensated to some extent for the thinning effect, yield was also reduced in 1986 and 1988 [P = <0.05], but over the four years, total yields from both thinned and unthinned trees were similar, as Table 2 shows. The Dabinetts in this trial were more biennial than the Michelin trees, their overall bienniality ranging from BI 0.20 – 0.58. Thinned Dabinett trees were the most annual cropping, and their BI fell significantly throughout the trial [Table 3].

e] Effect of treatments on the juice quality

Juice specific gravity and sugar content behaved each year in a similar way; a slow rise to a peak at 50% natural fruit drop, then a sharp fall [Fig 1]. The range of juice sugar levels from late picked, ripe samples of fruit was 12 – 16% for Michelin, and between 12 – 18 % for Dabinett, depending on the year [Table 4], producing a starting gravity for fermentation from 1045 – 1073^{o} . This variation in sugars depended largely on the weather during the summer. Speed of fruit ripening also varied seasonally but was more dependant on crop load; large fruit from lightly cropping trees ripening before smaller fruit from heavily cropping trees. On average over the four years of sampling, juice from fruit harvested early had 8.5% and 9.9% less sugar than fully ripe fruit from Michelin and Dabinett respectively. These differences are of the same order as seasonal variations.

Summary

Although there are no differences in yields over four years from either Michelin or Dabinett, the regularity of yield from year to year is affected both by the date on which the fruit is picked and whether or not a routine fruitlet thinning spray is applied.

Early picking of Michelin is beneficial in retarding the onset of biennial cropping as trees age and may to some extent obviate the need for thinning sprays. This trial suggests that harvesting could begin up to three weeks earlier in orchards that contain a high proportion of this variety with no long term loss of yield.

However, very early picking that needs such vigorous shaking that causes spur damage, will result in loss of crop the following year. Late harvesting, when fruit is completely mature and ready to drop naturally, may result in losses due to rotting on the ground.

Although Dabinett showed no loss of yield from early picking, the results from this trial indicate that this may accentuate biennial cropping, especially if trees are left unthinned.

A routine post blossom thinning spray of carbaryl and NAA was beneficial to regular cropping of both Michelin and Dabinett with no long term effect on yield.

The response to the thinning spray varied from year to year. It appeared to be linked to the quantity of blossom and early fruit set and is to some extent self-regulating, being greater in 'on' years and less in 'off' years. Results from this trial confirm the benefits of a routine thinning spray, and that a decision to spray based on an annual assessment of thinning need may not be required, unless blossom or weather conditions at flowering time are abnormal.

Early harvesting inevitably means some loss of potential sugar for fermentation, but any loss may be similar to or even less than natural seasonal variations in sugar levels due to weather conditions.

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October 2003

TABLES

Table 1a. Michelin: Mean annual fruit number per tree [calculated]

Year	Early pick	Late pick	Thinned	Unthinned	SED 10 df.
1986	1433	1363	1323	1454	119.6
1987	1261	1150	1196	1213	199.3
1988	1679	1531	1426	1739	142.7
1989	1039	633	952	750	106.3
1990	1714	1548	1474	1788	287.3
1986-89	5412	4677	4895	5156	294.0

Table 1b. Dabinett: Mean annual fruit number per tree [calculated]

Year	Early pick	Late pick	Thinned	Unthinned	SED 10 df.
1986	1655	1396	1224	1752	103.3
1987	498	777	592	672	137.2
1988	1275	1029	884	1353	80.8
1989	618	491	624	503	71.0
1990	1178	1018	938	1258	70.5
1986-89	4046	3693	3324	4279	238.4

Table 2a. Michelin: Mean annual fruit weight per tree [kg]

Year	Early pick	Late pick	Thinned	Unthinned	SED 10 df.
1986	65.2	72.5	69.9	68.1	4.07
1987	57.9	65.0	63.5	60.0	6.13
1988	75.6	81.4	76.4	80.0	5.05
1989	53.4	41.6	53.4	43.1	4.80
1990	83.8	81.4	81.5	83.7	4.5
1986-89	252.2	260.5	263.2	251.2	12.44

Table 2b. Dabinett: Mean annual fruit weight per tree [kg]

Year	Early pick	Late pick	Thinned	Unthinned	SED 10 df.
1986	84.3	85.7	78.5	89.9	3.84
1987	37.9	56.0	50.0	44.7	8.03
1988	73.6	71.9	64.8	78.8	5.16
1989	45.7	40.7	50.7	37.5	5.66
1990	65.9	59.1	57.7	66.2	5.95
1986-89	241.4	254.4	244.0	250.8	16.27

Table 3. Overall bienniality index [BI calculated from years 1986 – 89]

Picking date	Fruitlet thinned	Michelin	Dabinett
Early	Yes	0.13	0.30
Early	No	0.27	0.58
Late	Yes	0.23	0.20
Late	No	0.32	0.41
Approx. SED 10 df		0.08	0.11

Table 4. Mean sugar levels from 4 years of sampling [% sucrose]

	Michelin		Dabinett	
Year sampled	Early pick	Late pick	Early pick	Late pick
1987	11.8	12.5	11.3	12.0
1988	11.6	12.6	11.9	12.8
1989	14.3	16.1	15.7	17.7
1990	11.6	12.7	12.4	14.7
Mean	12.3	13.5	12.8	14.3