Project title: Determination of the optimum pruning time for fruit wall orchard systems for Gala apple

Project number: TF 207

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The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.
# CONTENTS

## GROWER SUMMARY

- Headline ................................................................. 1
- Background and expected deliverables ........................................ 1
- Summary of the project and main conclusions ................................. 2
- Financial benefits ........................................................................ 2
- Action points for growers ............................................................ 2

## SCIENCE SECTION

- Introduction .............................................................................. 3
- Materials and methods ................................................................. 5
- Results ..................................................................................... 10
- Discussion .................................................................................. 20
- Conclusions .............................................................................. 21
- Technology Transfer ................................................................. 21
- References ................................................................................. 21
GROWER SUMMARY

Headline

- Mechanical fruit wall cuts made after blossom reduced yields in comparison to winter hand pruning.

Background and expected deliverables

The fruit wall concept originated in France in 1986 where the system’s potential to reduce pruning costs and increase yields was demonstrated. As UK growers consider adopting the fruit wall system, this trial aims to establish the optimum time to make the pruning cut. The timing of the cut determines the amount of vegetative re-growth and also whether the bud behind the cut becomes floral or remains vegetative. Determining the optimum time to perform the pruning cut will help to achieve maximum productivity from the fruit wall system.

The project was designed to test the effect of four timings of pruning a fruit wall mechanically compared to a winter hand pruned control. In addition, a further set of treatments were imposed in order to compare the effect of pruning between the trees by hand during the dormant period. Impacts of the cut timing on the yield, fruit quality and vegetative re-growth will be assessed. The trial will be conducted over five years in order to assess the long-term effects of the treatments.

Summary of the project and main conclusions

The trial was established to determine the optimum time to prune orchards planted as a fruit wall and to establish the effects of inter tree pruning. The five year trial established in 2012 is laid out in an existing commercial orchard of dessert apple variety Gala (clone Galaxy). 2013 was the second year of timed pruning treatments but the first year of inter tree pruning which was carried out in winter 2012/2013.

The pruning timings were based upon different growth stages: pink bud, 6 new leaves, 9 new leaves and 12 new leaves (or when 50% terminal buds were present).

There were significant effects of the time of pruning and inter tree pruning on the yield and fruit size. The winter hand pruning treatment gave the greatest yield and the smallest fruit size. There was no effect of treatment on the percentage red colouration. The maturity of fruit, as determined by percentage starch and fruit firmness at harvest, was not affected. However, differences in the Total Soluble Solids (TSS) were observed, with the pruning cuts made at the 6 and 9 leaf stages leading to lower values. The extension growth and number...
of leaves was significantly reduced as pruning after blossom was delayed, confirming the results found in 2012.

In the first year of inter tree pruning, small effects on growth and fruit sugar levels were recorded in the plots pruned at the 9 & 12 leaf stage. Tests during subsequent years will show whether these are transient effects.

**Main conclusions**

- Mechanical fruit wall cuts made after blossom reduced yields in comparison to winter hand pruning.

- As the timing of the mechanical pruning was progressively delayed, less vegetative re-growth was stimulated.

- Mechanical cuts made at 6 or 9 leaves resulted in lower levels of leaf nitrogen and magnesium. Cutting at the 6 leaf stage also reduced leaf calcium levels to below optimum.

- Pruning cuts made at the 6 and 9 leaf stage reduced the Total Soluble Solids (TSS).

- Inter tree pruned treatments generally gave an increase in fruit size.

**Financial benefits**

The 2013 growing season was the first season where the combined effects of both the mechanical cuts and inter tree pruning were measured. The financial benefits are yet to be determined.

**Action points for growers**

- Early indications after two years of the trial are that where the grower’s priority is growth control, later cuts are more effective but these can have adverse effects on fruit sugar levels.

- Care needs to be exercised if the system is adopted, as yield reductions compared to conventional pruning have been recorded.
SCIENCE SECTION

Introduction

Growers in many countries are actively looking for ways to reduce labour inputs and increase mechanisation in a range of fruit crops. The fruit wall concept originated in France in 1986 when CTIFL began a project which aimed to reduce growing costs in top fruit production. Around the same time a harvesting robot known as the Magali was developed and CTIFL adapted an orchard to create a narrow tall hedgerow (the fruit wall) to accommodate the robot and maximise the use of automation at harvest. As a result the work by CTIFL demonstrated the potential of the fruit wall growing system in reducing the costs associated with hand pruning and increasing Class I yields. However, differences in cropping were shown between the south and north of France with the trial plots in the north performing less well than in the south.

The fruit wall system is now being considered as an option for commercial practice in the UK, as mechanisation of pruning and other operations, for example thinning, is possible and requires a modified tree architecture to be successful. Results from the original work by CTIFL in France can be applied to growing areas further north, but only by adapting the methods, particularly the time of pruning, to the local growing conditions.

Three key factors influence total productivity from a fruit wall orchard:

- Planting density
- Tree architecture
- The timing of pruning

These factors all have an effect on extension growth, flower initiation and yield by influencing light interception and distribution by and through the canopy and the total amount of fruiting wood in the orchard. The management of these factors determines whether the fruit wall is able to provide increased and sustainable yields throughout the life of the orchard.

Hampson et al. (2002) demonstrated that planting density can have a greater influence on productivity than the training system (tree height and shape). Trees planted at lower density were more productive per tree than at a higher planting density due to reduced competition for resources, however higher planting densities tend to be more productive per hectare. Palmer et al. (1992) suggest that Leaf Area Index (LAI) increases with increased planting density with greater light interception as a result. Higher planting density systems tend to increase yields per unit area through more efficient use of ground area until a natural limit is
reached (Weber, 2001). For the fruit wall system to achieve greater productivity it should make improved use of the unit ground area than traditional orchard system designs.

Hampson et al. (2004) demonstrate in their study that the percentage of fruit with acceptable colour was reduced with increased planting densities. Red colouration is an indicator of fruit quality and therefore as planting density increases the percentage of Class I fruit may become compromised. The tree architecture of the fruit wall system has the potential to overcome issues such as reduced red colouration, as the trees tend to be narrower than in traditional orchards and result in less shading of the fruit. It will be essential to maintain the narrow shape and size of the trees comprising the fruit wall to maximise the light distribution throughout the tree. In the fruit wall system a pruning cut is made by a tractor mounted mechanical cutter bar during the summer rather than in the winter to create an A-shaped tree, which is 40cm wide at the top and 80cm wide at the base.

However the aim of pruning is not only to achieve the narrow A-shape trees but also to encourage flower bud formation. Flower bud formation usually occurs during August (Abbot, 1974; cited in Dennis, 2003) and so conditions prior to this are important in determining its extent. There tends to be negative correlation between vegetative growth and flower bud formation and so nitrogen applications which favour vegetative growth tend to reduce flower bud formation; whereas Plant Growth Regulators (PGRs) which retard vegetative growth tend to improve flower bud formation. In the fruit wall system, the pruning cut is made during the summer and the timing of the cut is critical in determining the amount of vegetative regrowth and flower bud formation. This is also true for other crops such as cherry as Guimond et al. (1998) showed that flower initiation was stimulated by summer pruning and vegetative growth also increased due to the removal of apical dominance along the shoot.

If the fruit wall cut is made too early then vegetative growth will be favoured, reducing flower bud formation. However, if the cut is made too late the flower buds will have already formed and the cut will simply remove them. The optimal date for the fruit wall cut to be made may vary between varieties and between different seasons and therefore it is essential to relate the time of the cuts to an easily identified growth stage.

With mechanical pruning, the branches in between the trees are left unpruned and these can become thick and intertwined, resulting in shading and adverse effects on fruit quality. It is important for growers to know the effect, if any, of removing these branches, on yield and fruit quality.

The aim of the trial is to determine the optimum time for mechanical pruning the fruit wall of Gala (clone Galaxy) and to evaluate the effect of inter tree pruning. The results from 2013 presented in this report, include inter tree pruning treatments for the first time.
Materials and methods

The trial is based in an existing commercial orchard of Gala Galaxy on M9 planted in the winter of 2010 at Parsonage Farm, Cobham, Kent on a clay loam soil type. The trees are trained on a post and wire system with bamboo cane supports at a planting distance of 3.5 x 0.5m with 10 trees between each post, forming a bay and each plot consists of two bays. The trial area is comprised of 800 trees in 20 bays of 10 trees in each of the 4 rows.

<table>
<thead>
<tr>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>10</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>7</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 1. Plot layout.

The trial is a randomized complete block design with the 10 treatments replicated in 4 blocks. The treatments consist of 5 different pruning timings each of which have 2 sub-treatments with either inter tree pruning or no inter tree pruning. Each plot is composed of 20 trees: 6 guard trees at each end and 8 trees used for sampling and recording.

<table>
<thead>
<tr>
<th>6 guard trees</th>
<th>8 trees used for recording</th>
<th>6 guard trees</th>
</tr>
</thead>
</table>

Treatments

A description of the treatments is shown in Table 1. Each treatment consists of two parts: (a) the timing of the pruning cut and (b) inter tree pruning. The pruning cut was made by a tractor mounted mechanical cutter bar (with the exception of the winter hand pruning treatments). The earliest mechanical cut was made at pink bud (Treatments 3 and 4). The following mechanical cuts were made when the new extension growth had produced 6, 9 or 12 new leaves (Treatments 5 and 6, 7 and 8, and 9 and 10). The method of counting leaves to determine these stages is shown in Figure 3.
Inter tree pruning was carried out in Winter 2012/13 for the first time and consisted of removing one or two excessively strong, upright or long branches on each side of the tree which were causing shade. Any very weak low branches were also removed.

<table>
<thead>
<tr>
<th>Treatment number</th>
<th>Timing of fruit wall</th>
<th>Inter tree pruning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Winter by hand (Control)</td>
<td>Winter inter tree pruning</td>
</tr>
<tr>
<td>2</td>
<td>No inter tree pruning</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Pink bud</td>
<td>Winter inter tree pruning</td>
</tr>
<tr>
<td>4</td>
<td>No inter tree pruning</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>6 new leaf stage</td>
<td>Winter inter tree pruning</td>
</tr>
<tr>
<td>6</td>
<td>No inter tree pruning</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>9 new leaf stage</td>
<td>Winter inter tree pruning</td>
</tr>
<tr>
<td>8</td>
<td>No inter tree pruning</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>12 new leaf stage</td>
<td>Winter inter tree pruning</td>
</tr>
<tr>
<td>10</td>
<td>No inter tree pruning</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Fruit wall cut and pruning treatments.

Fruit wall cut timings

![Figure 2. Average number of new leaves and timings of pruning cuts 2013.](image-url)
<table>
<thead>
<tr>
<th>Date</th>
<th>Number of leaves</th>
<th>Date of cut</th>
</tr>
</thead>
<tbody>
<tr>
<td>22&lt;sup&gt;nd&lt;/sup&gt; January 2013</td>
<td>0</td>
<td>Winter hand pruning (22-01-13)</td>
</tr>
<tr>
<td>8&lt;sup&gt;th&lt;/sup&gt; May 2013</td>
<td>0</td>
<td>Pink bud (08-05-13)</td>
</tr>
<tr>
<td>29&lt;sup&gt;th&lt;/sup&gt; May 2013</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt; June 2013</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>13&lt;sup&gt;th&lt;/sup&gt; June 2013</td>
<td>5.4</td>
<td></td>
</tr>
<tr>
<td>17&lt;sup&gt;th&lt;/sup&gt; June 2013</td>
<td>5.8</td>
<td>6 Leaf (21-06-13)</td>
</tr>
<tr>
<td>24&lt;sup&gt;th&lt;/sup&gt; June 2013</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td>29&lt;sup&gt;th&lt;/sup&gt; June 2013</td>
<td>8.5</td>
<td>9 Leaf (02-07-13)</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; July 2013</td>
<td>9.2</td>
<td></td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt; July 2013</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>9&lt;sup&gt;th&lt;/sup&gt; July 2013</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td>11&lt;sup&gt;th&lt;/sup&gt; July 2013</td>
<td>11.8</td>
<td>12 Leaf (15-07-13)</td>
</tr>
</tbody>
</table>

Table 2. Dates of the pruning treatments.
Figure 3. Showing number of fully expanded leaves. Note the basal whorl of small leaves are ignored.
Assessments

1. The number of new leaves produced on 25 shoots per plot, were counted twice weekly from the end of May until mid-July 2013 when growth ceased. The average number of leaves per shoot was calculated to determine the timing of the cuts.

2. The length of new extension growth and number of leaves produced on the shoots arising from the bud immediately behind the pruning cut were recorded on 14th August and 13th November 2013. Where no mechanical cut was made (winter hand pruning) the current season’s growth was recorded.

3. The effects of treatment on leaf and fruit mineral content were determined on 13th August and 16th September 2013 for the leaf and fruit analysis respectively. One leaf was selected from two thirds along the length of 25 extension shoots per plot. 25 fruit were selected at random from the guard trees in each plot.

4. The harvest assessments were conducted at the same time as the farm’s commercial harvest (23rd to 25th September 2013). The assessments included:
   - Total yield from the 8 experimental trees in each plot.
   - 100 fruit from each plot were used to calculate the average fruit weight (g), fruit diameter (mm) and percentage red colour (%).
   - Tests were conducted to determine the effect of the pruning treatments on fruit quality and maturity, using the same methodology as the UK Quality Fruit Group to assess the percentage starch, flesh firmness and Total Soluble solids (TSS).

Statistical analysis

Statistical analysis of the data was carried out using Analysis of Variance (ANOVA) to determine the overall significance of each treatment followed by the use of multiple range tests to determine whether the differences between individual treatments were significant. Where data was not normally distributed, such as in the percentage red colouration or the percentage starch, the data was transformed using a logit transformation prior to statistical analysis. Graphs are shown with standard error bars and the results of the multiple range tests are given where differences between treatments were significant.
Results

Vegetative re-growth
As the time of pruning after blossom was delayed there was an increased effect on suppressing regrowth. These reductions in extension growth were significant. The cut at pink bud produced similar level of extension growth to the winter pruning, see Figure 4. Inter tree pruning treatments did not significantly affect the amount of regrowth except in the plots pruned mechanically at the 9 leaf stage. The number of leaves arising from the bud behind the pruning cut was also significantly different for each treatment, following the same pattern as that of the shoot re-growth, varying from 13 leaves for the winter hand pruning and pink bud treatments to 4 leaves for the pruning cut at the 12 leaf stage (see Figure 5).

Some late season growth continued after the final pruning cut. Shoot measurements from 14th August and 13th November 2013 showed that the fruit wall cuts made at the 6 leaf, 9 leaf or 12 stage stimulated more growth (see Figures 6 and 7).

![Figure 4](image-url)

**Figure 4.** The effect of the pruning treatment on the extension growth arising from the bud behind the pruning cut (assessed 14th August). Standard error bars are shown and the letters reflect statistical significance (P<0.0001).
Figure 5. The effect of the pruning treatment on the leaf number arising from the bud behind the pruning cut (assessed 14th August). Standard error bars are shown and the letters reflect statistical significance (P<0.0001).

Figure 6. The effect of the pruning treatment on the extension growth arising from the bud behind the pruning cut (assessed 13th November). Standard error bars are shown and the letters reflect statistical significance (P<0.0001).
Figure 7. The effect of the pruning treatment on the leaf number arising from the bud behind the pruning cut (assessed 13\textsuperscript{th} November). Standard error bars are shown and the letters reflect statistical significance (P<0.0001).

Yield

The mechanical cut at the 12 leaf stage resulted in the lowest yield, which was significantly less than the yield from the winter hand pruning and pink bud treatments. However, the yield of the plots pruned at the 6 leaf and 9 leaf stages was statistically similar to the winter hand pruning and pink bud treatments and also to the later cut at 12 leaves (see Figure 8).

Figure 8. The effect of the pruning treatment upon the average yield per tree (kg). Standard error bars are shown and the letters reflect the significance of treatments (P=0.0013).
**Fruit size and diameter**

The pruning cut at the 12 leaf stage produced the largest fruit while the winter hand pruning and pink bud cuts produced the smallest fruit (see Figure 9). There was a significant increase in fruit diameter for the winter hand pruning treatment when inter tree pruning was carried out in comparison to no inter tree pruning. Although not statistically significant, increases in fruit diameter were observed in the inter tree pruned sub plots of the pink bud and 12 leaf stage pruning treatments.

Fruit weight (g) also followed the same pattern as fruit diameter, with general increases in size for most treatments when inter tree pruning was carried out in comparison to no inter tree pruning, however these differences were not statistically significant. The heaviest fruits were produced in plots pruned at the 12 leaf stage and this difference was significant when compared to fruit from the winter hand pruning treatments (see Figure 10).

![Figure 9](image-url)

**Figure 9.** The effect of the pruning treatment on the average fruit diameter (mm) at harvest. Standard error bars are shown and the letters reflect the significance of treatments (P=0.0036).
Figure 10. The effect of the pruning treatment on the average fruit weight (g) at harvest. Standard error bars are shown and the letters reflect the significance of treatments (P=0.0268).

**Fruit colour**

There were no significant differences in the percentage red colouration of the fruit between treatments. The Galaxy cone of Gala, used in this project, is a naturally well coloured clone and all treatments were sufficiently coloured to meet supermarket specifications (see Figure 11).

Figure 11. The effect of the pruning treatment on the percentage surface coloured block red at harvest (%). Standard error bars are shown.
**Fruit quality and maturity**

The percentage starch at harvest varied on average from 89% to 95% (see Figure 12) and there were no significant differences between treatments. The average fruit flesh firmness varied from 9.5 to 10kg/cm$^2$ between treatments and again there were no significant differences (see Figure 14).

The highest levels of Total Soluble Solids (TSS) were recorded in the winter hand pruned plots and in the plots mechanically pruned at pink bud and at the 12 leaf stage with inter tree pruning. Generally there was a reduction in TSS from the mechanical cuts made at the 6 and 9 leaf stage and no consistent effect of inter tree pruning (see Figure 13).

![Figure 12. The effect of the pruning treatment on the average percentage starch at harvest. Standard error bars are shown.](image)

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Figure 13. The effect of the pruning treatment on the average total soluble solids (°Brix) at harvest. Standard error bars are shown and the letters reflect statistical significance (P=0.0193).

Figure 14. The effect of the pruning treatment on the average fruit flesh firmness at harvest. Standard error bars are shown.

Fruit and leaf analysis

Although no significant differences were found between treatments in the fruit analysis (see Table 4), significant differences were found for a number of the leaf minerals (see Table 3). There were significant treatment differences in nitrogen, magnesium and calcium levels. Leaf nitrogen and magnesium levels were lower in the plots pruned at 6, 9 and 12 leaves, and the values were below the optimum for apples. The winter hand pruning and pink bud
treatments had the highest values for leaf nitrogen and magnesium. Leaf calcium levels varied considerably between treatments, with low levels observed in the pruning treatment at the 6 leaf stage, but with optimum levels in the other pruning treatments. There were also significant differences between treatments for the boron and manganese levels however all treatments were within the industry standard range (see Table 3).
<table>
<thead>
<tr>
<th>Leaf analysis</th>
<th>(% dry weight)</th>
<th>(mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>P</td>
</tr>
<tr>
<td>T1 Winter hand pruning- with</td>
<td>2.47 (de)</td>
<td>0.20</td>
</tr>
<tr>
<td>inter tree pruning</td>
<td>(0.07)</td>
<td></td>
</tr>
<tr>
<td>T2 Winter hand pruning- no</td>
<td>2.37 (cde)</td>
<td>0.20</td>
</tr>
<tr>
<td>inter tree pruning</td>
<td>(0.14)</td>
<td></td>
</tr>
<tr>
<td>T3 Pink bud-</td>
<td>2.42 (de)</td>
<td>0.20</td>
</tr>
<tr>
<td>with inter tree pruning</td>
<td>(0.04)</td>
<td></td>
</tr>
<tr>
<td>T4 Pink bud-</td>
<td>2.50 (e)</td>
<td>0.20</td>
</tr>
<tr>
<td>no inter tree pruning</td>
<td>(0.10)</td>
<td></td>
</tr>
<tr>
<td>T5 6 Leaf-</td>
<td>2.11 (ab)</td>
<td>0.21</td>
</tr>
<tr>
<td>with inter tree pruning</td>
<td>(0.14)</td>
<td></td>
</tr>
<tr>
<td>T6 6 Leaf-</td>
<td>2.08 (a)</td>
<td>0.20</td>
</tr>
<tr>
<td>no inter tree pruning</td>
<td>(0.04)</td>
<td></td>
</tr>
<tr>
<td>T7 9 Leaf-</td>
<td>2.18 (abc)</td>
<td>0.21</td>
</tr>
<tr>
<td>with inter tree pruning</td>
<td>(0.05)</td>
<td></td>
</tr>
<tr>
<td>T8 9 Leaf-</td>
<td>2.03 (a)</td>
<td>0.21</td>
</tr>
<tr>
<td>no inter tree pruning</td>
<td>(0.09)</td>
<td></td>
</tr>
<tr>
<td>T9 12 Leaf-</td>
<td>2.29 (bcd)</td>
<td>0.19</td>
</tr>
<tr>
<td>with inter tree pruning</td>
<td>(0.15)</td>
<td></td>
</tr>
<tr>
<td>T10 12 Leaf-</td>
<td>2.32 (cde)</td>
<td>0.20</td>
</tr>
<tr>
<td>no inter tree pruning</td>
<td>(0.09)</td>
<td></td>
</tr>
<tr>
<td>Significance (P-value)</td>
<td>0.0001 n.s</td>
<td>n.s</td>
</tr>
</tbody>
</table>

Table 3. Leaf analysis results from sampling on 13th August 2013. Standard errors are given in parenthesis and the letters reflect the significance of treatments determined through ANOVA.
Table 4. Fruit analysis results sampled 16th September 2013. Standard errors are given in parenthesis and the letters reflect the significance of treatments determined through ANOVA.


Discussion

The 2013 season was one of the latest during the last 20 years and the delay in growth and blossom was reflected in the timing of the pruning treatments. This emphasised the importance of judging any treatment timings by a definitive growth stage rather than by a calendar date. An interesting observation was that, despite the late growing season, the trees produced shoots with more than 12 leaves, whereas in 2012 the shoots formed a terminal bud before 12 leaves had been produced. The fact that the trees were still vegetatively active later in the season in 2013 may account for some of the effects observed in the reduction levels of nitrogen and magnesium from the later cuts.

Yields were again higher in the winter hand pruned plots. This is probably due to the greater tree volume. It is expected that in time the mechanically pruned trees will produce a greater number of short fruiting laterals within the tree canopy and that should lessen this difference. The inter tree pruning has produced some significant effects in some plots and these differences are expected to increase as the trees in the plots with no inter tree pruning will get progressively thicker and more shaded.

The mechanical cuts at the 6 and 9 leaf stages again reduced sugar levels in the fruit, but this effect was less than in 2012 and not significantly different between the non inter tree pruned plots. In this second year of the trial less of the leaf canopy was removed in the summer pruned plots which could account for the smaller treatment effects this year.

As in 2012, as post blossom cuts were delayed there was a significant extra reduction in regrowth, but the pink bud cut produced extension shoots as long as in the winter hand pruning plots. Where growers are looking for growth control as an objective, the later timings give significant advantages but there are still indications that a small reduction in fruit sugars can occur.
Conclusions

- Significant reductions in yield have again been recorded from the plots pruned after blossom.
- Reductions in fruit sugars seen last year have been repeated in post bloom pruning treatments but were not significantly lower in all the plots.
- Differences between the plots with and without inter tree pruning were not consistent and no firm conclusions can be drawn.

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Technology Transfer

- Results from the 2013 season were presented at the FAST LLP growers' conference in February 2014.
- The trial was reported in the 2014 HDC Tree Fruit Review.
- Results of the trial were presented at the EMRA/HDC Tree Fruit Day in April 2014.

References


