To Cut or Not To Cut:
The Role of Extension Growth in Fruit Quality

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Extension growth (current season leaf growth) occurs throughout the fruit growing season and can be a strong source of **assimilates**. However, while growing they can also be **a strong sink; hence the question; to cut or not to cut?** Summer pruning can be used to reduce vigour, or promote light interception but can it also be used to reduce competition for assimilates between growing fruit and extension growth?

What is the role of extension growth on fruit quality?

This study aims to elucidate the role of extension growth to current season fruit quality, and on buds into the following season. To achieve this leaf (and therefore potential phloem-supplied water) was removed at different times in relation to both climate, and stage of fruit growth.

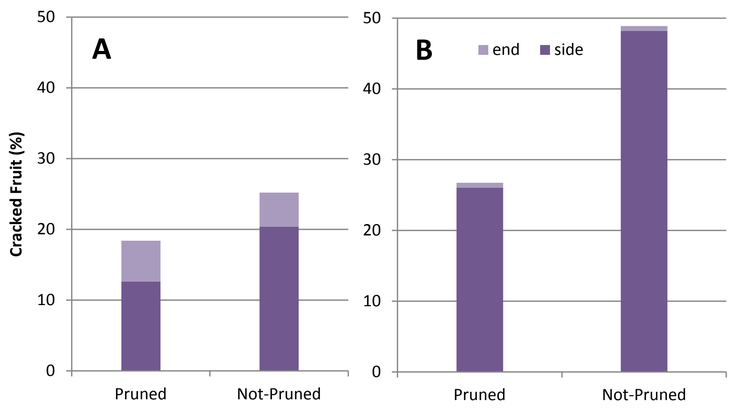

Figure 1 Percentage of cracked fruit (divided into side and end cracks) at harvest from trees in Trial 1 (A) and Trial 2 (B) which had been pruned or not-pruned 1WBH. There was a significant effect of level on end cracks (lsd = 3.2 and 10 respectively)

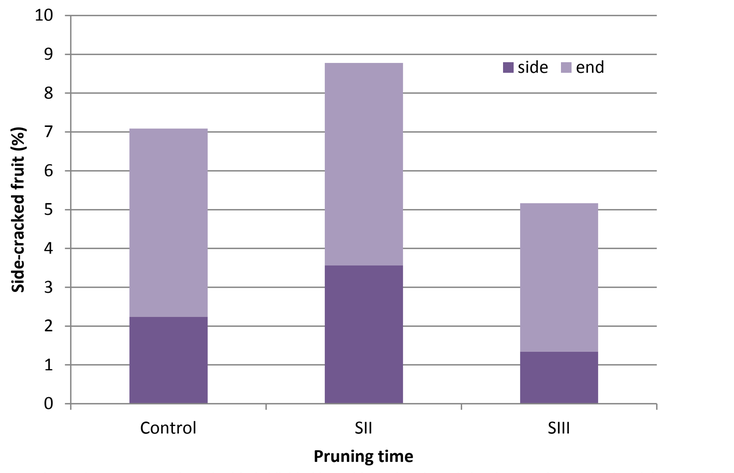

Figure 2 Percentage of cracked fruit (divided into side and end cracks) at harvest from trees in Trial 5 pruned at different growth stages. There was a significant effect of level on side cracks (lsd = 1.3)

Variety 'Sweetheart', 'Satonishiki' and 'Kordia' were used in five trials in southern Tasmania. Extension growth was removed at various growth stages during the summer. At harvest maturity fruit were sorted into side-cracked, end-cracked (apical and stem-end) and non-cracked fruit and a subsample assessed for quality parameters (size, diameter, firmness, TSS and TA) as per Measham et al. (2009). Bud burst (as indicated by 'side green') in the following season was calculated by visually assessing each bud on two-year old wood samples. Buds were collected during the summer period (early February) and during the following dormancy then analysed for sugars using UPLC.

There was a significant effect of pruning during rainfall 1 week before harvest (WBH) on total and side (P=0.001 and P<0.001) cracks in Trials 1 and 2 (Figure 1). In Trial 2 cracking was reduced by nearly 50%. In Trial 3, without rainfall there was no significant effect of pruning 3WBH on cracking. In Trial 4, prior to rainfall there was no significant effect of pruning 1WBH, and in Trial 5 there was a significant effect of pruning at different growth stages on cracking levels. A significant difference (P<0.001) in side cracks was found between pruning times; pruning at Stage II increased cracking, while pruning at Stage III (1WBH) decreased cracking (Figure 2).

Trials 1 and 2 both showed that pruning at Stage III resulted in significantly (P<0.001) increased sugar levels in fruit, however no differences in size or weight were seen. In Trial 3, a significant (P<0.001) increase in sugars was also seen in fruit from trees which had been pruned during SIII (Figure 3). This treatment did not result in any differences in firmness, size or weight. Trial 5 again showed a significant (P=0.03) increase in sugars in fruit from trees pruned at Stage III, but not in fruit pruned at Stage II (Figure 4).

Bud sucrose concentration increased over time, irrespective of the variety and sucrose was present in the highest concentration by the onset of dormancy. There was no significant effect of pruning on sucrose in developing buds, or on the time taken to reach bud burst (data not shown).

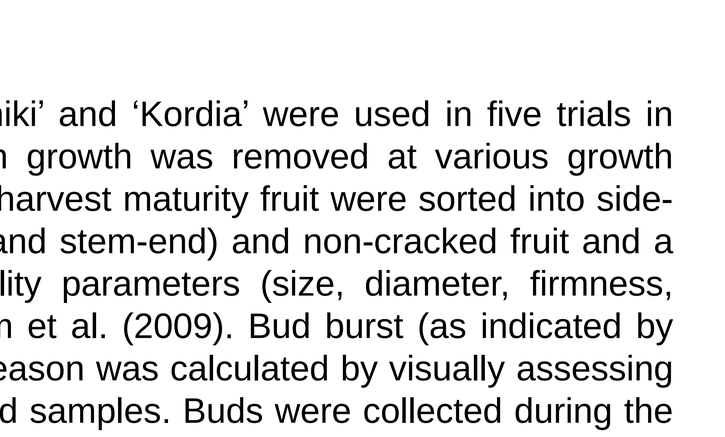

Figure 3 The total soluble solid levels (A) and percentage of side-cracked fruit (B) from trees not pruned (control) , pruned at Stage III of fruit development in Trial 3. A significant effect (*) of pruning was seen on TSS.

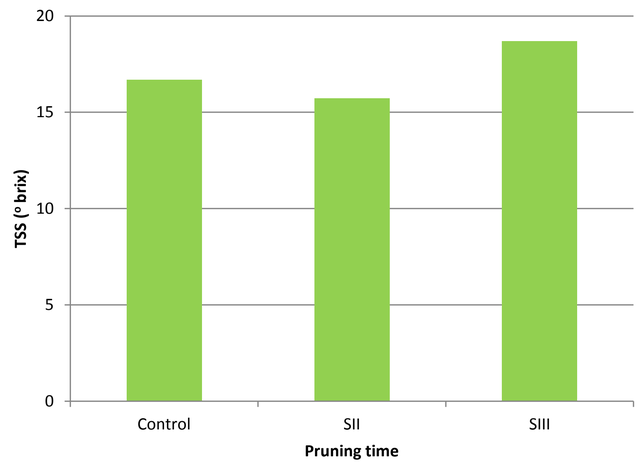

Figure 4 The level of soluble sugars in fruit from trees not pruned (control) and pruned at either Stage II (SII) or Stage III (SIII) of fruit in Trial 5. A significant (*) difference was seen in fruit pruned at Stage III.

The increase in fruit soluble solids is consistent with studies investigating carbohydrate allocation. Demand from various organs can occur simultaneously as would be the case with both developing fruit and developing extension growth. Strategic shoot pruning alters the allocation of resources sourced through photosynthesis as influenced by leaf area. It should also be noted however, that leaf area influences the level of carbohydrates available during the growing season, and removal of leaf area during some periods may result in insufficient allocation to the fruit, and lowered fruit quality.

This study showed that **strategic pruning in Stage III can reduce cracking**. Good results were seen when this occurred **during a rainfall event**. **Pruning earlier in fruit development however negatively impacted on fruit quality**. Pruning at Stage II allowed for extension growth to be renewed and present by the time the critical cracking susceptibility period occurred. This study also showed that any **beneficial effects of pruning on current season fruit quality will not impact on future seasons**.

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