New directions in crop load management
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As we are aware, optimal management of crop load is a difficult task and most orchardists find the spring period very stressful as they try to juggle the currently available tools for crop load management with unstable weather conditions in an effort to maintain regular yields, consistent production of high quality fruit and high pack-out percentages.

The current recommendations of a combination of dormant pruning to remove weak spurs and unbalanced limbs to open up the tree, followed by the use of chemical thinning during flowering and the early post-bloom period can be successful. However the responses from chemical thinning are often unpredictable, leading to the need for considerable hand-thinning that is both expensive and time consuming. The end result is often reduced fruit quality and sub-optimal return bloom the following year.

Under the umbrella of the Australian apple and pear industry five year Productivity, Irrigation, Pests and Soils (PIPS) flagship program funded through Horticulture Australia Limited (HAL), researchers from New Zealand, Queensland, and Tasmania are working together to optimise tree function by manipulating structure – this is the Tree Structure component of the PIPS program.

Tree Structure research team:
• PFR (NZ): Dr Stuart Tustin, Dr Ben van Hooijdonk, Ken Breen
• Agri-Science Queensland (DAFF): Dr Simon Middleton, Dr John Wilkie
• TIA: Dr Dugald Close, Dr Sally Bound.

The Tree Structure project is undertaking similar studies in multiple environments across Australia. This component of the program aims to improve orchard productivity and optimise fruit quality by improving tree functional efficiency as part of the ongoing drive in development of high density orchard systems.

Outcomes of the project will include management strategies for Australian growing environments and provision of tools and systems for manipulating tree structure that can be used to optimise orchard productivity.

Apple varieties under investigation are ‘Royal Gala’ and ‘Cripps Pink’ in the Huon Valley, Tasmania; Stanthorpe, Queensland; Lenswood, South Australia – Year 1 only; and Shepparton, Victoria – Years 2-5; and the new cultivar RS103-130 in Queensland.

The program has now been running for three years. Fruiting efficiency on different bud types was examined in Year 1, and Years 2-5 are focussing on comparing precision-managed and conventionally-managed trees with equivalent crop loads over a four year period.

Floral bud type and fruit quality
The objective in Year 1 (2009-10) was to quantify the genotypic expression and regulation of fruit traits of the principal Australian-grown apple cultivars, ‘Royal Gala’ and ‘Cripps Pink’, in three locations with differing environmental stresses: Stanthorpe, Adelaide Hills and Huon Valley. The potential new cultivar RS103-130 was also included at Stanthorpe.

Results from the first year studies have clearly demonstrated that not all flower buds are equal when it comes to fruit size. Axillary flower buds (on 1st year wood) always produce smaller fruit. In ‘Cripps Pink’ fruit size was greatest on terminal buds across all regions. No difference in ‘Gala’ fruit size was noted between spurs and terminals in South Australia, but in Tasmania and Queensland terminals produced bigger fruit than spurs.

The greater fruit size potential of terminal floral buds appears to be associated with a greater leaf area and photosynthetic potential.

Precision management versus conventional management
Artificial Spur Extinction (ASE) is a tree training and bud thinning method which precisely defines where and how much fruit is set on the tree. The aim of ASE is to promote the vigour and performance of floral spurs, stimulate spur strength and improve fruit quality and regularity of production.

The initial setup of trees for ASE involves removal of unbalanced (large) limbs and training of remaining limbs to a slightly pendulous or drooping position, which optimises fruiting whilst restricting excessive vegetative growth. Floral spurs are then selectively removed while...
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果树仍然处于休眠状态，以准确地定义潜在果实的密度和位置。trees are still dormant to precisely define the density and location of potential fruit on the tree.

这意味着，在芽萌发时，ASE树木将携带比传统修剪的树木少得多的强壮果芽，从而使树木可以将更多的能量集中到这些芽中，进而携带更大的优质水果负载。

一旦设置完成，ASE果园应该需要较少的年度维护，以保持生长，并且每一年都会产生更一致的果实产量。

果树结构对果实产量的影响

我们已经度过了ASE作物管理组件的两个赛季。数据仍在分析中，但对于第二个赛季的结果，看起来不错。回花量足够提供充分的果实产量潜力，即使没有化学打薄。

在传统树管理中，牡蛎和终端芽中无法结果的比例可能从30%到50%不等。在ASE处理中，果实产量在个别花芽上得到了增加，这一响应在较低的花芽密度下最明显。没有设定任何果实的枝干减少到10%以下，而双果枝的数量增加。

下一步怎么办？

如果果实质量和产量继续保持相当于甚至超过ASE生产系统的话，那么ASE可能提供一种潜在的替代生产技术。利用ASE在芽萌发之前精确调整潜在的水果数量。一旦树木被设定好，修剪要求将会降低，每年只需要轻修剪，手薄果将减少到打破群果到单果。因此，化学打薄将被去除。这一后果是更可靠且可预测的收益，而且在季节的早期产生产量应该更省力——这是一个主要优势，因为劳动力是生产中最大的成本。

有关如何设置使用ASE的树木的信息将在未来几年内通过Future Orchards™计划来提供。
A sequential spray program allows lower quantities of chemical to be used at each timing, thus reducing the risk of over-thinning. If the chemical thinners have been effective then all that should be required is a subsequent light hand thin to remove damaged fruit or break up any remaining bunches.

To achieve good thinning and fruit quality, all chemical thinners need to be applied at the appropriate physiological stage and under the climatic conditions which are best suited to each chemical. A non-ionic surfactant such as Kendene® (Tween 20) is recommended with all thinners, except for carbaryl/thiram.

Choice of thinning chemical is important as some cultivars do not respond well to some chemicals. The currently recommended chemical/cultivar combinations are shown in Table 1.

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