

Improving sweet cherry yield security and fruit quality



In 2009 Professor Matt Whiting from the Washington State University in USA was sponsored by Fruit Growers Tasmania to present his cherry research results at the annual May Conference in Strahan.

As a result of great relations beginning with this visit, a research project was developed in collaboration with TIA, allowing Dr Whiting's trials to be conducted counter-seasonally in Tasmania in 2010 and 2011. Dr Dugald Close and Dr Sally Bound saw to the Tasmanian side of the research. Eric Smith from WSU visited for four months in 2010/11 season to ensure similar methodologies. Eric Mertes did his honours research in nutrients as part of this trial as well. The following pages show some of the results found in both Washington State and Tasmania.



Above: A cherry limb not long after ethephon spray

Below: About 30 days after ethephon spray

Summary of Significant Findings

- Fruit set varies significantly from day to day (measured in Sweetheart, Kordia, Van and Lapins)
- Natural fruit set is low when flowers open during windy, hot conditions
- Pollen germination-rate and growth-rate don't appear to limit fruit set in cultivars with low productivity
- The short period of ovule longevity appears to limit productivity (fruit set) in Regina, and Benton varieties. (The ovule inside the blossom becomes the pip within the fruit.)
- Fruit set in Regina, Tieton and Benton can be improved with plant growth regulators (PGRs) applied during bloom
- Fruit quality potential is related to timing of flowering when crop load is high
- Fruit quality potential is unrelated to timing of flowering when crop load is low
- Fruit quality potential is similar for all buds in a spur
- Fruit quality is highest for single-fruit 'clusters' compared with multiple-fruit 'clusters'. (A cluster is the fruit set in a single floral bud.)
- The earlier the thinning, the better the fruit quality response
- Thinning benefits in fruit quality depend on the fruit density – there are benefits from thinning after pit hardening if crop density is high
- Trials with BA, ABA, methyl jasmonate, and NAA showed no efficacy as post-bloom thinners
- Ethephon and PCa + ABA show potential as post-bloom thinners applied 2 – 3 weeks after full bloom

Fruit set and effective pollination period

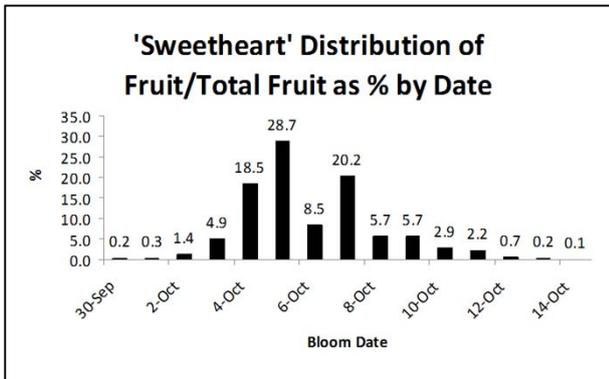
All previous studies of fruit set have been accomplished by counting flowers on a *single day early in bloom*, and counting final fruit numbers near harvest – a technique that reveals nothing about the variability in fruit set nor the underlying causes.

From tagging individual flowers on the day of opening we were able to study fruit set on a daily basis, throughout the flowering period. In addition, we have a preliminary dataset for modeling flowering progression with key environmental parameters.

Across both years, we documented tremendous variability in fruit set under field conditions in Lapins, Kordia, Van, and Sweetheart throughout the bloom period. For example, fruit set varied from a low of 10% to 100% in Lapins, across the 18-day bloom period (Fig. 1). At this stage we are analyzing variability in fruit set with daily



Left: Spurs with single floral bud Right: Double floral buds



Above: Nearly 30% of the crop was set in blossom that opened on one day. 70% of the crop set on blossom that opened on three days.

weather conditions to identify patterns and key environmental factors. Preliminary analyses show no relationship between temperature on the day a flower opens and fruit set.

Interestingly, fruit set from hand pollinations was similar to that of open pollinated flowers on most days. This suggests there weren't many days when pollinator activity was limiting to fruit set.

Timing of thinning

The research team investigated thinning at key stages of fruit development to see what impacts there were in fruit yield and quality, for Bing and Sweetheart in 2010, and Van and Sweetheart in 2011. In addition, they investigated target crop loads by thinning entire trees down to 1, 2, or 4 floral buds per spur. This work was intended to answer a few simple questions – *when is the best time to thin?*, and, *to what targets should we thin?*

In every case, earlier thinning was beneficial compared with thinning later in the season. For example, when crop load was adjusted by thinning dormant buds or flowers at full bloom, 'Sweetheart' fruit weight was about 17% heavier compared to later thinning timings, which were similar. The results with 'Sweetheart' contradict slightly the previous results that showed benefits from thinning up to early stage II of fruit development. This may be due to the relatively light crop load in the 'Sweetheart' trial – when crop load is heavier, later thinning may be

beneficial, as late as early stage III in heavily cropped trees. However, the results do underscore the importance for thinning programs to be imposed as early as possible in the fruiting timeline. The significant challenge of course is

not knowing what fruit set is until well past full bloom. Future work will continue to investigate post-bloom thinning strategies.

Interestingly, the team observed a clear relationship between crop load and susceptibility to cracking – incidence of split fruit was dramatically higher in trees with low fruit density and large fruit size.

Potential post-bloom thinners

In 2011 the research team repeated trials of various PGRs as post-bloom thinners for sweet cherry. Trials were conducted on 'Sweetheart', 'Bing', and 'Rainier', all on 'Gisela' rootstocks. Single applications were made at about 3 weeks after full bloom, approximately the stage I – stage II transition (i.e., pit formation was beginning in some fruit).

In contrast to 2010 results, effective thinning with Ethephon was documented in all cultivars. None of the other PGRs (BA, ABA, methyl jasmonate, NAA) were effective though BA did improve fruit size slightly without inducing any thinning.

There did not appear to be any collateral damage to the Ethephon-treated trees – leaves did not abscise and shoot growth continued. Thinning was clearly excessive with Ethephon (see photos on front page). The next research project will investigate rate and timing response for multiple cultivars. The development of an effective post-bloom thinner for sweet cherry would give growers a convenient tool for managing crop load.

For more information please contact

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