

Crossing the Threshold;

Adaptation tipping points for the Australian fruit industry

'Crossing the threshold: Adaptation tipping points for Australian fruit trees' is a three year project which commenced in 2013 looking at cherry, apple and pear crops. It aims to align tree responses to climate information, assess how climate affects dormancy, bloom timing, yield potential and extreme heat damage. This will inform industry of when climate may consistently disrupt tree function into the future. Adaptation strategies, such as netting and rootstock selection will also be evaluated. This is relevant information when making decisions about suitability of varieties, optimising production into the future, and to better inform industry when practice change is required.

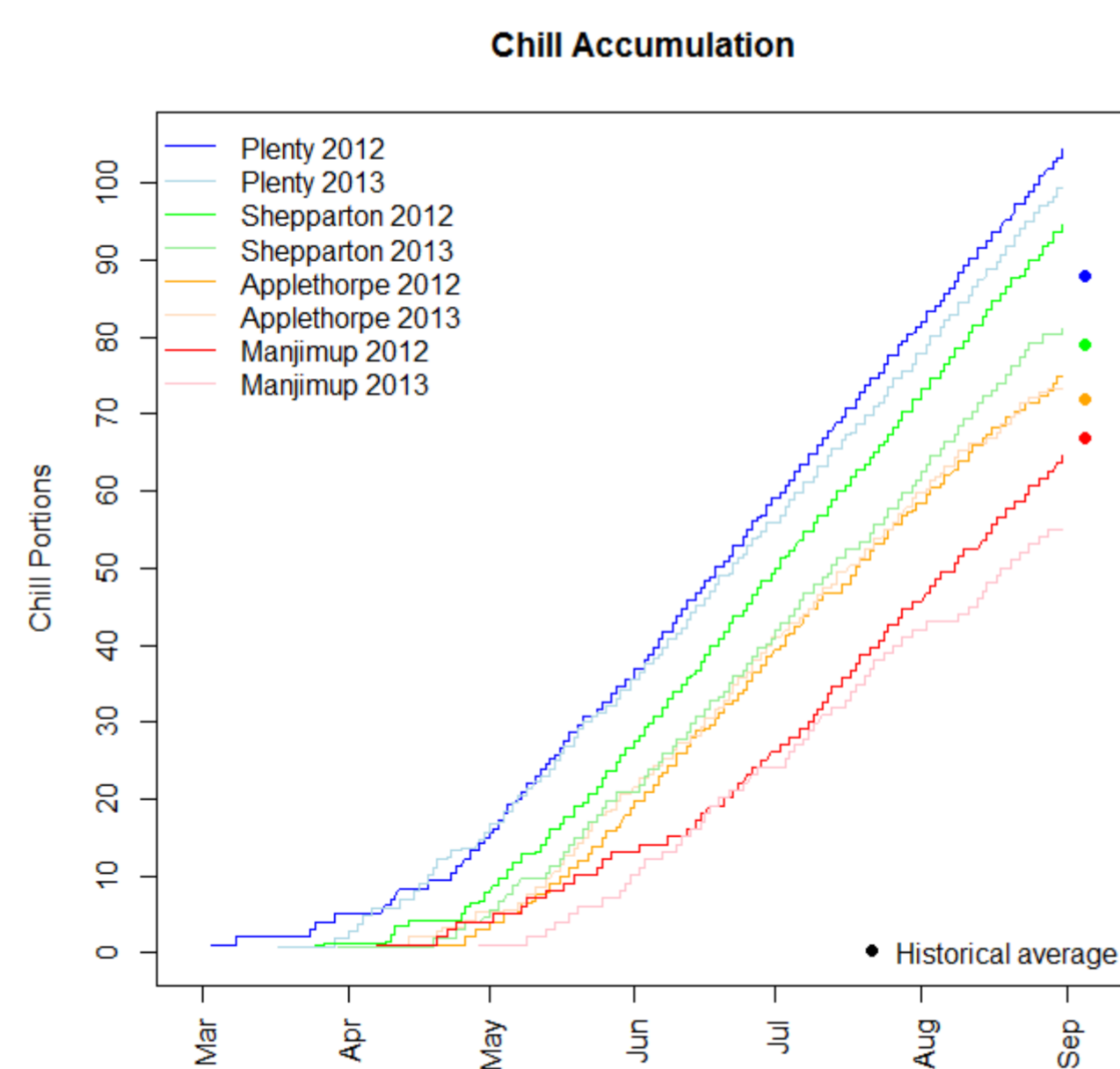
This project is led by Victoria's Dr. Rebecca Darbyshire, with a collaboration of agencies; Uni of Melb, DPI Vic, DAFFQ, UTAS/TIA, DAFFWA

What's happened so far?

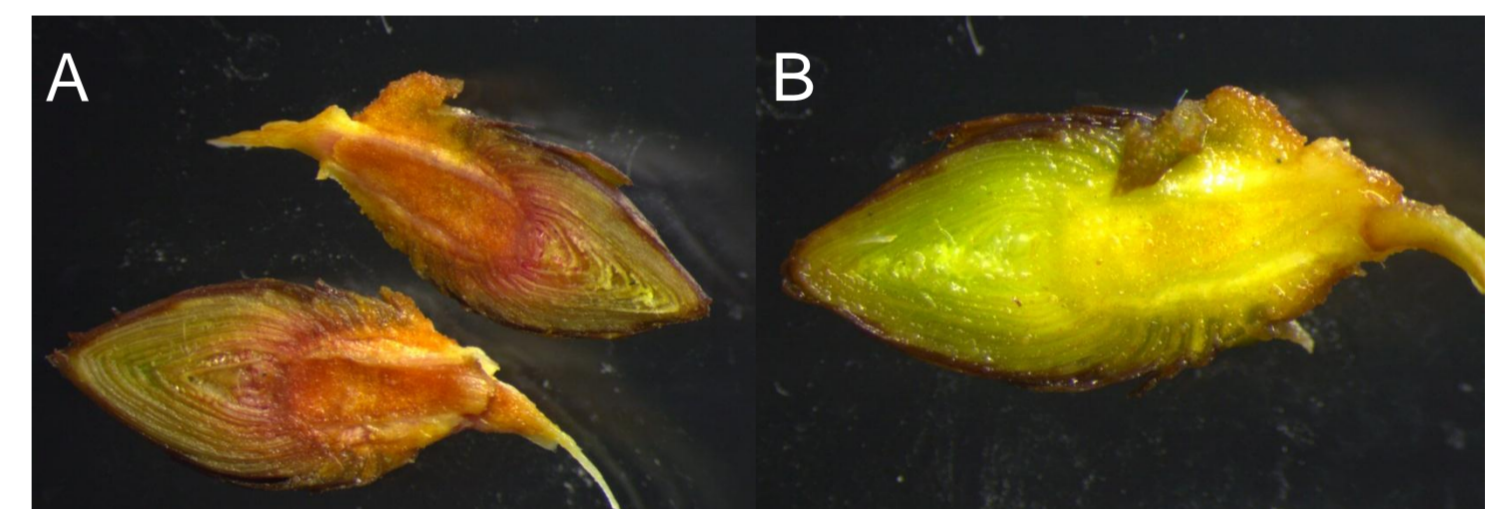
Climate and tree phenology for the 2013-14 growing season have been closely monitored in cherry and apple and pear. Bud burst and flowering times have been recorded to determine when trees reach 5% green tip 80% flowering. This climate and phenology data will be used to develop models of flowering timing. Yield data and associated climate information for the 2014 season has also been collected for Pink Lady apple at all sites. These will be used to evaluate if the existing North American yield model 'MaluSim' is suitable for use in Australia. Levels of heat as related to fruit surface and air temperatures data have been collected over the 2013/14 summer in Victoria. Preliminary contour maps of extreme heat tipping points have been constructed.

What's happening now?

The current time of year provides a good opportunity to explore the start and release of dormancy in buds. Currently there is some difficulty in knowing when buds are fully dormant, and how the start of dormancy relates to chill models. Buds of cherry and apple are being collected regularly and tested for respiratory activity using tetrazolium salt solution (which is a receptor for hydrogen ions released during respiration and will induce a colour change - red). It is anticipated that a reduction, and delayed increase, in colour will indicate the induction and release of dormancy. Additionally, dormant wood from cherry and apple trees will be collected for use in a controlled environment experiment to artificially force buds to open to estimate chill requirements.



Accumulated chill over two seasons in a number of sites



'Lapins' cherry buds from Plenty in Tasmania showing activity after exposure to tetrazolium (A) and an untreated bud (B)

What's still to come?

The project will produce a series of maps indicating what each region can expect in the future regarding insufficient winter chill, spring frost risk, extreme heat exposure and potential yield. Further information on the suitability of adaptation strategies will also be provided to assist in the timely application of strategies critical for Australian horticulture to secure future industry success

What are we learning about Tasmania?

This project is still in the early stages, but already strong patterns are emerging. The previous two seasons in Tasmania (2012 and 2013) experienced average or above average chill. Tasmania is achieving higher chill values than sites in the other states, up to 40% more than Western Australia. Tasmania also experienced relatively few days in the last season for which the temperature threshold for fruit browning was crossed. Young, Donnybrook and Tatura are at the highest risk of sunburn damage.

Project members;

Project Leader – Rebecca Darbyshire (rebecca.darbyshire@unimelb.edu.au)
VIC - Ian Goodwin (ian.goodwin@depi.vic.gov.au)
QLD - Heidi Parkes (heidi.parkes@daff.qld.gov.au)
WA - Susan Murphy White (susn.murphywhite@agric.wa.gov.au)
TAS - Penny Measham (Penelope.Measham@utas.edu.au)

Dr Penny Measham
Perennial Horticulture Centre
Tasmanian Institute of Agriculture
Private bag 98 Hobart, TAS, 7001 Australia
Telephone +61 3 6226 1870
Penelope.Measham@utas.edu.au



Australian Government
Department of Agriculture



TIA is a joint venture between the University of Tasmania and the Tasmanian Government

This project is supported by funding from the Department of Agriculture