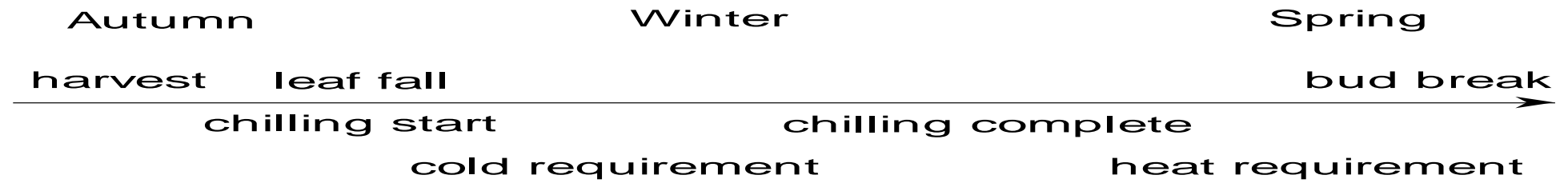


CHILL

Why do deciduous trees need chill

- In plant evolution, natural selection played an important role.
- After leaf fall in Autumn, some occasion days may become warm, some plants may have bud break immediately. When weather became colder in winter, those that leafed out early died.
- Other plants, after leaf fall in Autumn, warm weather cannot made them bud break immediately. These plants insist a certain cold period, then bud break. This will be more save for survival. Then these plant survived by natural selection.

Chill requirement



How to measure Chill

Until recently there has not been much serious research on the chill requirements of Pistachios

1. Hours below 7°C model , “about 1,000” hours
2. Utah models, adjusts for high and very low temps
3. Dynamic model – complex mathematics that calculates Chill Portions that depend upon the temperature of the hour before

Measuring Chill

PGA project lead by Jianlu Zhang with Cathy Taylor showed that the Dynamic Model provided the most reliable measure and quantified the requirements for Sirora.

- Shoots taken into greenhouse to force bud break weekly from early July to early September.
- Measured the chill units using different models.
- Compared the actual and predicted results.
- Compared the chill units in various Australian regions in previous seasons with the known results of those seasons
- The required Dynamic Chill Units calculated – 59 units by end August.

Table Calculated chill completion dates

season	Chill completion (59 Portions)	
	Mildura	Renmark
04/05	10 Aug	18 Aug
05/06	3 Sep	11 Sep
06/07	1 Aug	6 Aug
07/08	24 Aug	13 Oct
08/09	14 Aug	19 Aug
09/10	1 Sep	15 Sep
10/11	16 Aug	21 Aug
11/12	8 Aug	1 Sep
12/13	4 Aug	11 Aug
13/14	19 Sep	25 Oct
14/15	26 Aug	6 Sep

Lack of Chill

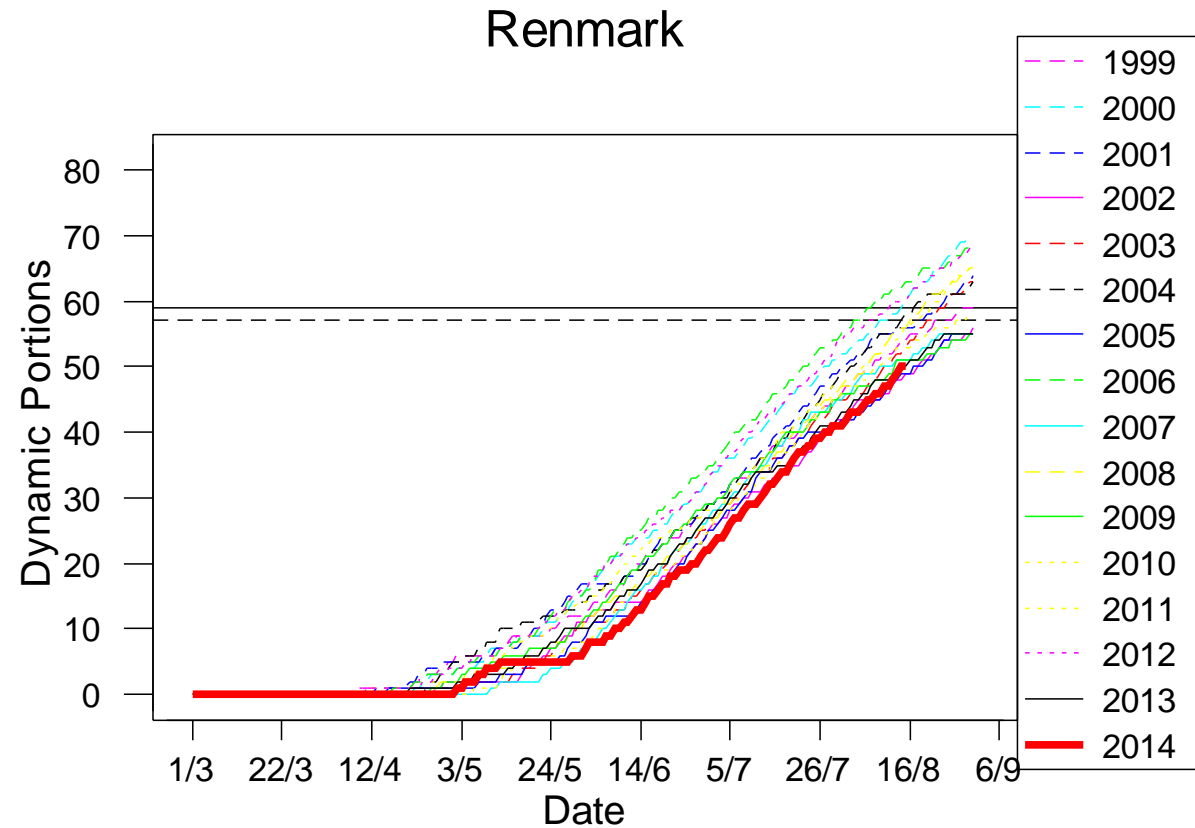
13th November



Lack of Chill – what does it do?

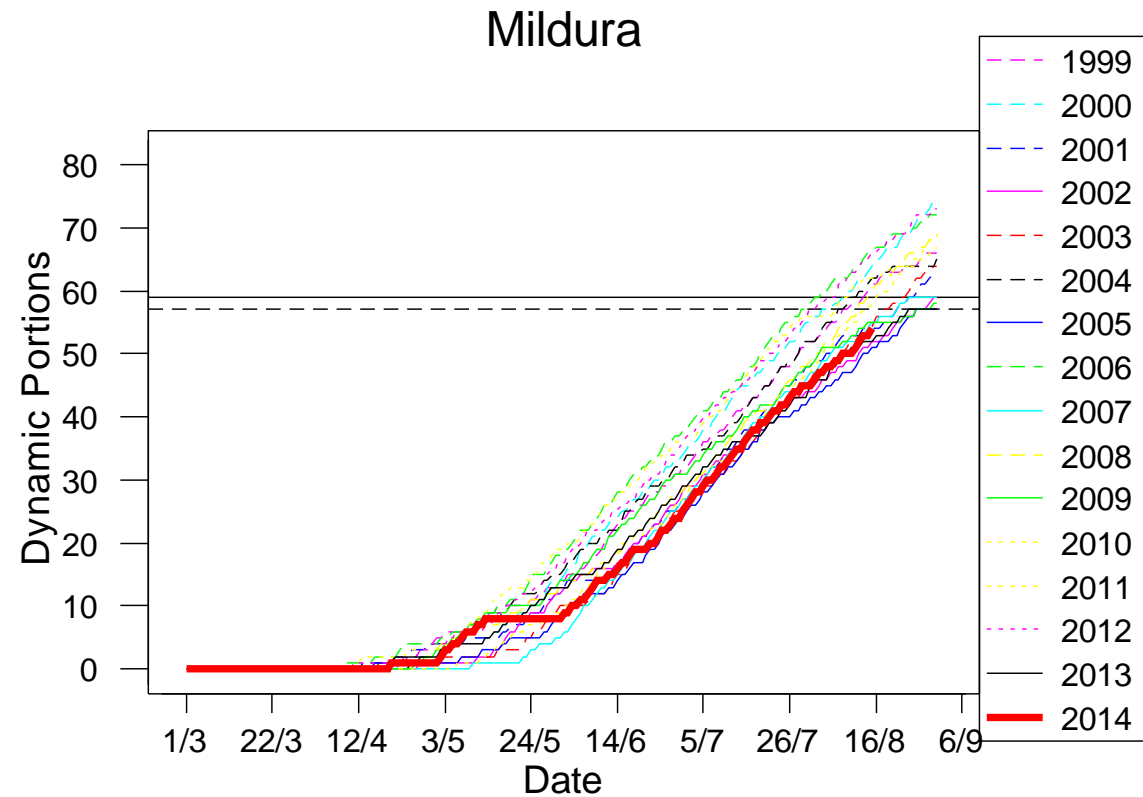
- Flower and vegetative buds do not open quickly and evenly in Spring. Some buds may not open until November, December or even January.
- Fruit from late flowers may not be pollinated and will not mature at the normal harvest time. Up to 2/3^{rds} of the current crop lost
- Late opening vegetative buds (Nov, Dec, Jan) do not carry fruit buds like the October opening buds. Up to 2/3^{rds} of the following crop is lost.

Report for Renmark 15th August 2014



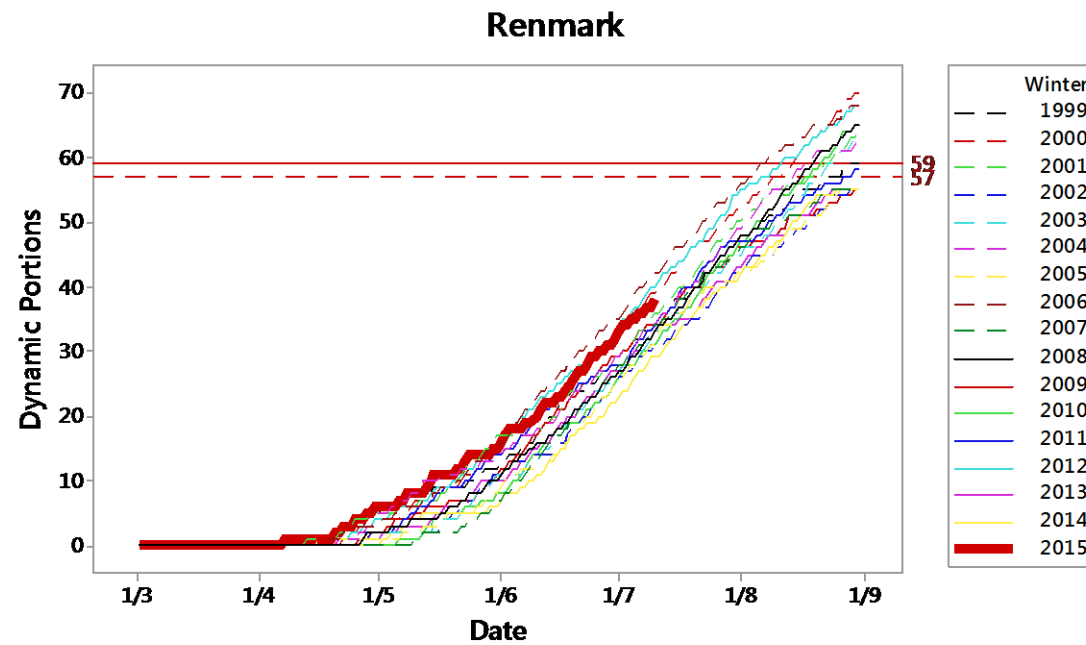
PGA research shows that 59 Dynamic Portions between 1st March and 31st August is sufficient chill. 57 Dynamic Portions to 15th August will in 95% of years produce 59 Portions by 31st August.

Report for Mildura 15th August 2014



PGA research shows that 59 Dynamic Portions between 1st March and 31st August is sufficient chill. 57 Dynamic Portions to 15th August will in 95% of years produce 59 Portions by 31st August.

Renmark 10th July 2015



*PGA research shows that 59 Dynamic Portions between 1st March and 31st August is sufficient chill.
57 Dynamic Portions to 15th August will in 95% of years produce 59 Portions by 31st August.*

Mitigating the effect of insufficient chill

- Australian and Californian research shows that spraying with winter oil in late August can significantly mitigate the impact of lack of chill
- Complete coverage of every part of the tree critical. Slow tractor speed <3kph critical.
- Regular application of oil over many seasons shows no damage
- Details of concentrations and application rates recommended to contributors by PGA