

## Dormancy Breakers in low Chill Years

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A Pomewest funded trial was set up in 2016 to test the effect of dormancy breaking sprays in a low chill environment. The use of dormancy breaking sprays is a potential adaptation for the apple and pear industry to warmer years as they have been shown to stimulate earlier, more homogenous bud burst and flowering in a number of crops grown in mild climates worldwide. The two national climate change projects undertaken for the pome fruit industry have highlighted that Western Australia is vulnerable to low winter chill and strategies to manage winter chill are going to be an important part of the pome fruit industry.

The trial set out to compare three dormancy breaking products; Dormex® (Cyanamide), Waiken® (Methyl esters of fatty acids) and Erger® (Decanol alkoxyate fertiliser adjuvant) on four apple cultivars (Cripps Pink, Granny Smith, Fuji and Cripps Red). Two methods of timing the application of dormancy breakers were used; the first treatment applied after receiving 70% of the average winter chill (49 chill portions) and second timing at 35 days before expected bud burst (35 BEBB). Label rates were used on all products.

All four cultivars (Cripps Pink, Granny Smith, Fuji and Cripps Red) were sprayed after receiving 57 chill portions on 2 August 2016 this was 75% of the actual chill portions received at Manjimup. In 2016 Manjimup accumulated 76 chill portions from 1 March to 31 August which was one of the highest chill accumulating years (figure 1).

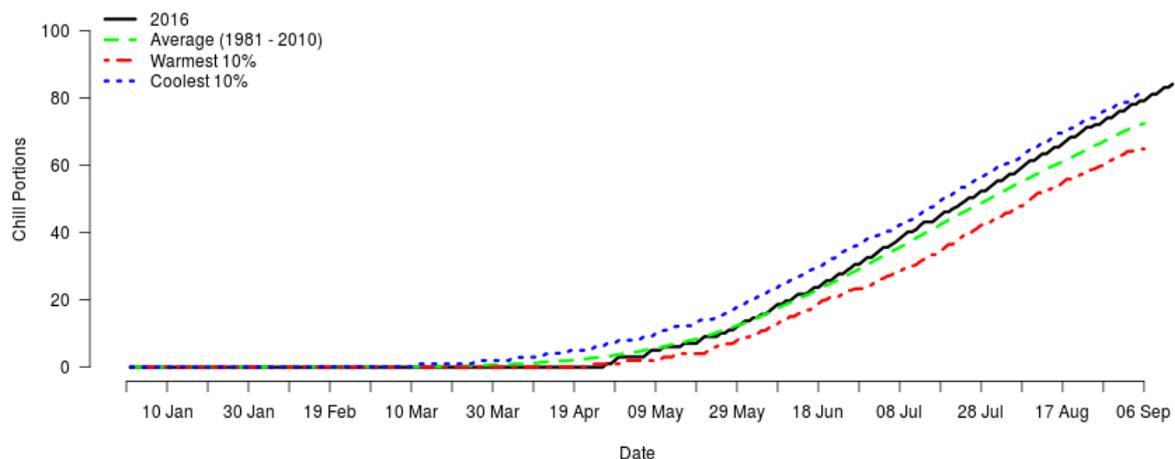


Figure 1. Winter Chill accumulation for Manjimup 1<sup>st</sup> March to 31<sup>st</sup> August 2016.

To determine the 35 days BEBB historical flowering records and chill accumulation records were used to predict the timing for all cultivars. The predicted chill accumulation resulted in the following treatment timing; Cripps Pink was sprayed at 21 days, Fuji 28 days, Granny Smith 32 days and Cripps Red 38 days before actual green tip (table 1).

Table 1. Timing of dormancy-breaking spray application on Cripps Red, Cripps Pink, Fuji and Granny Smith.

	Actual Spray Date	Green Tip Date	Spray Timing (days before green tip)	Chill Portions @ spraying
<b>Cripps Red 70%</b>	2/08/2016	9/09/2016	38	57 (75%)
<b>Cripps Pink 70%</b>	2/08/2016	14/09/2016	43	57 (75%)
<b>Fuji 70%</b>	2/08/2016	28/09/2016	57	57 (75%)
<b>Granny Smith 70%</b>	2/08/2016	16/09/2016	45	57 (75%)
<b>Cripps Red 35 BEBB</b>	2/08/2016	9/09/2016	38	57 (75%)
<b>Cripps Pink 35 BEBB</b>	24/08/2016	14/09/2016	21	71 (93%)
<b>Fuji 35 BEBB</b>	24/08/2016	21/09/2016	28	71 (93%)
<b>Granny Smith 35 BEBB</b>	18/08/2016	19/09/2016	32	64 (84%)

### **What did we see in the orchard during spring?**

From the 1<sup>st</sup> September through to November 32 trees of each cultivar (four trees per treatment at both timings) were monitored three times a week, green tips counted until 5% of the tree was in green tip, then first flower recorded and lastly number of flowers counted until full bloom (80% flowering) was reached. No toxicity was observed in any trees treated with dormancy breakers.

Green tip was observed early (1<sup>st</sup> September) in Dormex<sup>®</sup> treated trees in Cripps Pink at the 70% timing. All trees treated with Dormex<sup>®</sup> except the Cripps Pink 35 BEBB and Fuji 35 BEBB reached green tip first. The dormancy breakers applied at the 70% timing were sprayed at 43 days before green tip for Cripps Pink, Fuji 57 days and Granny Smith 45 days. Green tip was delayed in the trees treated with Waiken<sup>®</sup> at 35 BEBB, Cripps Pink and Fuji trees were sprayed at 21 days and 28 days respectively.

Flowering was compacted to 7 days from 18 days in the Cripps Pink 35 BEBB, Granny Smith 70% and 8 days Cripps Pink 70% and Fuji 70% timing trees treated with Dormex<sup>®</sup>. Flowering was extended in Fuji 70% sprayed at 57 days before green tip treated with Erger<sup>®</sup> and all treatments for the Fuji 35 BEBB.

Difficulty in predicting the season can mean sometimes product could be applied too late as not enough chill has been received and instead of advancing green tip it is delayed. As expected, Waiken<sup>®</sup> set back green tip when applied at 20 days BEBB, as seen in the Cripps Pink 35 BEBB sprayed at 21 days before green tip and Fuji 35 BEBB sprayed at 28 days before green tip. But when applied at 35-50 days BEBB green tip was advanced as seen in all cultivars treated at the 70% timing. However the Dormex<sup>®</sup> response was always earlier than the Waiken<sup>®</sup> treatments.

### **What effect was observed on fruit set?**

The Fuji trees treated with Waiken<sup>®</sup> 70% had the highest fruit set with 95% of the flower clusters setting fruit (figure 2). The overall fruit set in the Waiken<sup>®</sup> trees was higher than the Dormex<sup>®</sup> followed by Erger<sup>®</sup> and the trees treated at 70% had a better fruit set than the trees treated at 35 BEBB. Fruit set was not impacted by the compaction of the flowering period for cultivars treated at 70% timing. The Cripps Pink 35 BEBB showed a reduced fruit set and this treatment also had a compacted flowering.

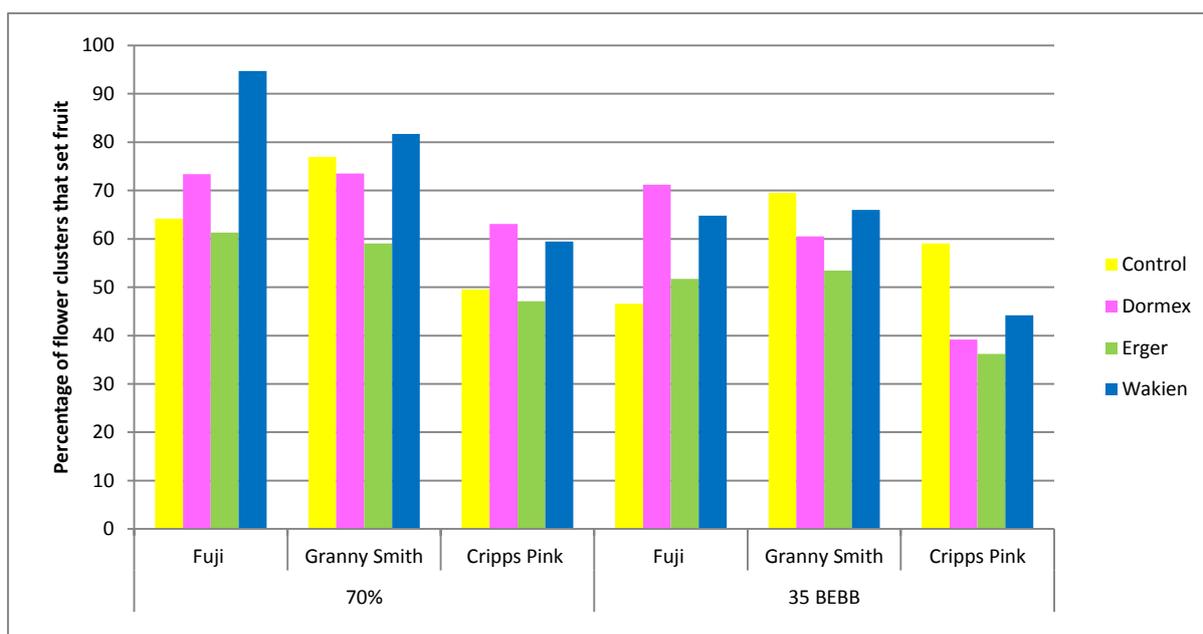


Figure 2. Fruit set for all cultivars across all treatments applied after reaching 70% of average winter chill and 35 days BEBB.

### **Did the dormancy breakers effect yield and variability of maturity at harvest?**

There was no measurable reduction in the variability of fruit maturity at harvest with any of the sprays (assessed by looking at colour and SPI), despite the effect on compaction of flowering. There were no differences in harvest timing or variability of maturity at harvest between treatments. Estimated yields were not impacted by any of the dormancy-breaking sprays on most treatments. But maybe Erger® treated Cripps Pink trees at both timings did result in lower yields (Figure 3).

A very obvious response was observed for flowering in the field after the application of Dormex® with compacted flowering seen in all cultivars except Fuji treated with Dormex® at 70% timing. Although, fruit set in the Waiken® treated trees performed better resulting in a better yield in this trial.

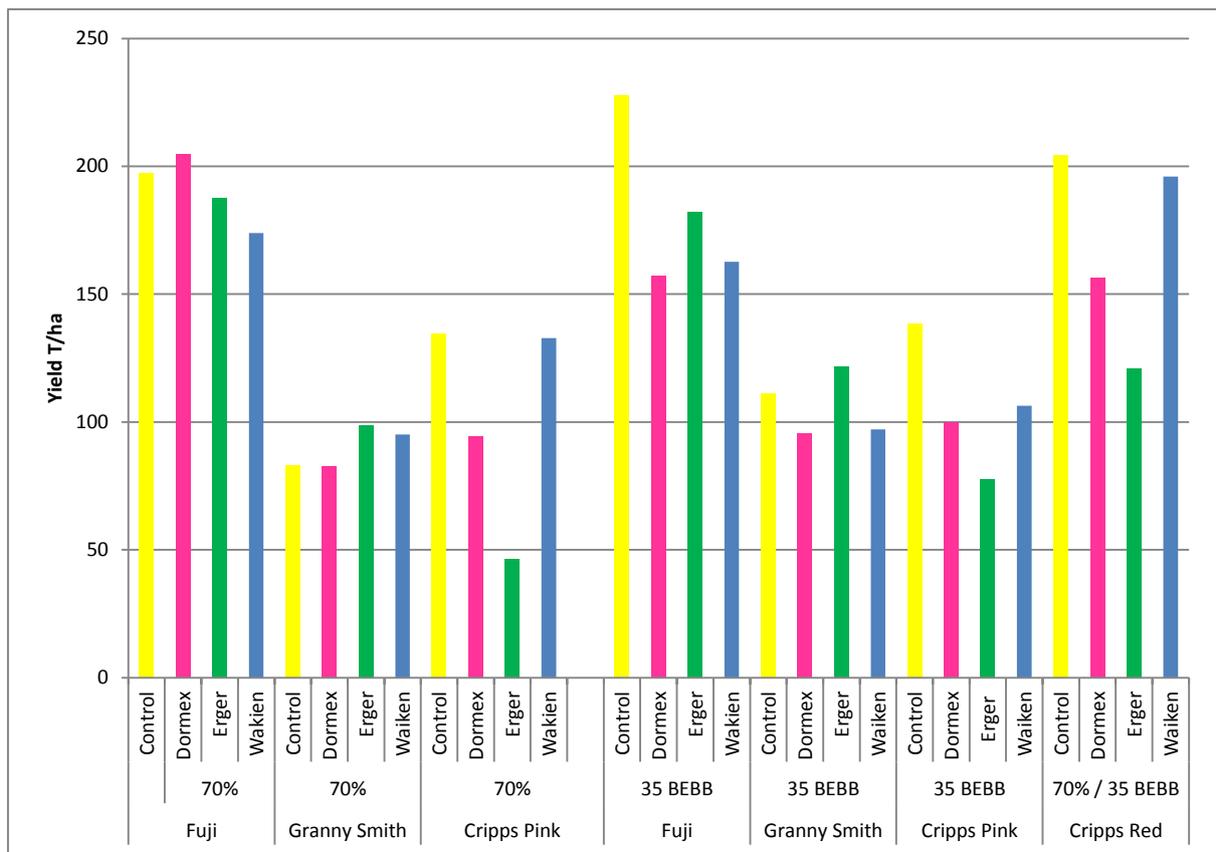


Figure 3. Estimated yield using number of fruit per tree and average fruit weight of a sample of 30.

In 2016 Manjimup received the most chill it had in a long time tracking along the coolest 10% of years, most old timers said winter was like the old days cold and wet. This is in contrast to 2017, where we are just below the warmest 10% of years. Our trial did not test a low chill year for Manjimup. But from our results we can conclude that dormancy breaking sprays can compact flowering making the progression from green tip through to full bloom more homogenous, resulting in a shorter flowering time making management in the orchard at flowering easier.

For the 2016/17 season estimating the application timing of dormancy breakers was more effective in advancing green tip and compacting flowering after receiving 75% (57) of the chill portions.



a Control – full bloom 21 oct



b Dormex® – end petal fall



c Erger® – 50% flowering



d Waiken® – first flowers

*Figure 4. Red Fuji trees on 19 October 2016 treated with dormancy breakers sprays 35 days before expected bud burst.*