

Effects of BdMax Zeroln on dry matter percentage and variability in kiwifruit

Simon Bud (VegGro Supplies), Gill Bacchus MSc (Soil to Soul),
Glen Atkinson Dip Hort (GarudaBD Institute), application by the growers concerned.

Abstract

Trials to determine effects of spraying BdMax Zeroln were carried out in autumn, 2006, on 5 Bay of Plenty kiwifruit orchards (4 Haywards and 1 Hort 16A). Zeroln was sprayed 2 – 3 times on trial blocks in March and April. Dry Matter (DM) % and variability (SD) were measured in 90 fruit samples taken 2 – 3 times during March and April from sprayed and non-sprayed blocks in 3 orchards and shortly before harvest in 2 orchards. On 4 of the 5 orchards, DM% was higher in samples from sprayed than those from non-sprayed blocks at the second and third sampling times. On the remaining orchard, fruit from sprayed vines had lower DM% but also lower variability in DM%, resulting in a higher rate of increase in Taste Zespri Index (TZI) values during the trial period for the sprayed blocks. At harvest time, samples from Zeroln sprayed blocks had a 34% higher TZI than those from control blocks in the Hort 16A orchard and a 48% higher TZI in one of the Haywards orchards. For the trial orchards for which Taste Zespri Grade (TZG) values were available, TZG was 18 – 28% higher for Zeroln sprayed blocks compared to control blocks. A rainy period about a week before the second sampling date may have contributed to differences in DM%.

Brix measurements for 1 orchard showed little difference in average brix levels between sprayed and unsprayed blocks, however minimum brix was higher for the sprayed than for unsprayed fruit samples (5.15 and 4.65 respectively).

From the data obtained it appears that Zeroln may increase DM% and decrease variability in DM%. This could increase the price paid for harvested kiwifruit. There may also be an effect on soluble solids (brix) levels. Statistically designed trials with the same spray and sampling dates on several orchards are needed to confirm whether this is the case.

Introduction

The prices paid to kiwifruit growers by Zespri are partly determined by the percentage dry-matter (DM%) in a 90 fruit sample. Zespri also takes into account the variability (standard deviation, SD) of DM% within this sample to calculate the Taste Zespri Index (TZI). The DM% depends on a number of factors including canopy density, pollination and fruit density. It may reduce during a rainy period, which can delay the time when the fruit is cleared for maturity to be picked, as well as reducing the value of the fruit. Currie and Nichols (2006) recorded a temporary reduction in 'Hayward' fruit dry matter by a maximum of 0.14 to 0.26 %-units after heavy rainfall in May 2005. They estimated that the maximum economic cost of this in 2005 would have been c. \$300/ha. 'Hort16A' dry matter was reduced by a maximum of 0.12 to 0.16 %-units at an estimated maximum economic cost of c. \$900/ha.

SD depends on many factors including the number of canes laid down, variability in orchard aspect, shelter, soil structure and fertility (SEEKA, 2004).

Zeroln is a homeopathic compound made from a selection of the biodynamic field and compost preparations. It has been observed to increase root growth and reduce water uptake, thus maintaining fruit dry matter during rainy periods.

Trials were carried out in 2006 on five kiwifruit orchards in the Bay of Plenty to investigate whether spraying vines with Zeroln affected DM% in the fruit.

Method

In March, 2006 several blocks or rows were separated into 2 distinct maturity areas, called control and trial in each of 5 commercial kiwifruit orchards. In four of the orchards (Dominion Park, BayView, Agrodome and Glencaroe the blocks involved were planted in the Haywards variety and in one orchard, Pepperpot, the Hort 16A (Gold) variety. All orchards were pergola and Kiwigreen managed orchards except that the Glencaroe orchard is organically managed. The Pepperpot vines were 6 years old, stubbed, with evergreen internal shelter. All the Haywards orchards had mature, low vigour vines. The Dominion Park orchard had white cloth internal shelter, Bayview had no internal shelter and Glencaroe is small, surrounded by shelter. None of the orchards trunk girdled their vines. All orchards except Glencaroe are near sea level in altitude.

On the dates shown in Table 1 below, 90 fruit samples were taken and tested for DM% by Eastpack laboratory (Bayview) and by AgFirst Laboratories for the other 4? orchards. On the dates shown in Table 1 the trial blocks were sprayed with Zeroln at the rate of 250 ml/ hectare. The control blocks were not sprayed. On the second dates shown, the spray treatment was repeated and Bd Max Etherics was also sprayed to prevent imbalance from the Zeroln spray. In some orchards Zeroln was sprayed a third time. Sampling and spray times are shown in Table 1.

Table 1 Dates of fruit sampling and Zeroln spraying on each trial orchard

Orchard	Pepperpot (gold)	Dominion Park	Bayview	Glencaroe	Agrodome
1 st spray date	13.3.06	13.3.06	21.3.06		
1 st Zeroln Spray	3.3.06	6.3.06	21.3.06	24.5.06	3.5.06
2 nd Zeroln Spray	14.3.06 (+ etherics)	16.3.06 (+ etherics)	30.3.06 (137*)	2.6.06	17.5.06
2 nd Sample Date	5.4.06 (168*)#	6.4.06 (140*)			
3 rd Zeroln Spray	25.3.06	-	-		
Harvest clearance date		26.4.06		3.6.06	6.6.06

•Days from Full Bloom

This date was just before harvest

Results and Discussion

Dry Matter, variability and TZI

The mean DM% and variability of 90 fruit samples from trial and control areas in each orchard are shown in Figures 1 and 2. The data in Figure 1 are from samples taken on 13 or 21 March, and on 3 – 5 April. The data in Figure 2 are from samples taken just before harvest, 26 – ? April.

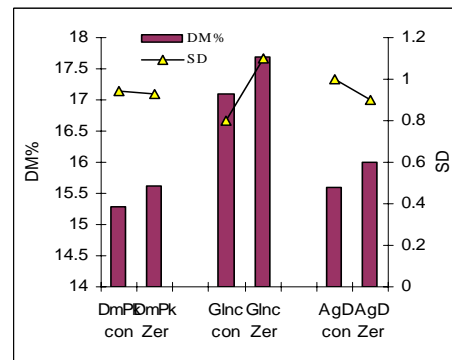
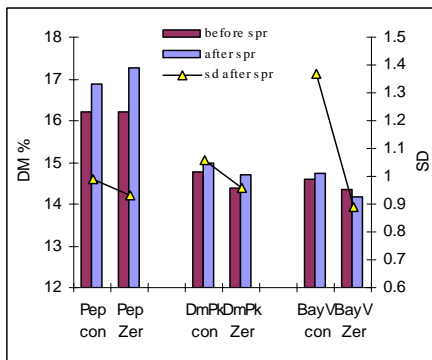


Figure 1. Mean DM % and SD of 90 fruit samples in control & trial blocks before & after spraying **Figure 2. Mean DM% & SD of 90 fruit samples in control & trial blocks at harvest**

At the second sampling time the mean DM% was higher for fruit from Zeroln sprayed than fruit from control areas in all orchards except Bayview (Figure 1). However the variability (SD) was much lower on the Zeroln sprayed blocks on the Bayview orchard. By late April when fruit was harvested on Dominion Park, Glencaroe and Agrodome orchards there was less difference in sample variability but a more consistent difference in DM% between control and sprayed blocks (Figure 2).

As sampling dates varied between orchards and control and trial DM% was not the same at the first sampling date in any orchard, the change in DM% and TZI per day was estimated for each sample to enable comparison between control and trial areas and between orchards (Figure 3).

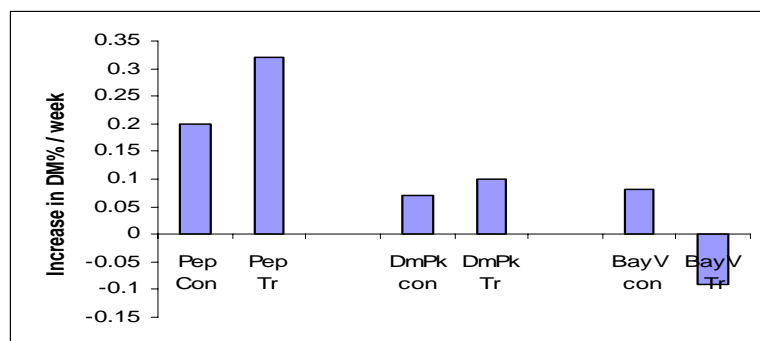


Figure 3. Increase in DM% per week between first and second sampling dates for control and trial blocks on three orchards

There are many other factors that affect DM and SD values, such as orchard location, weather, canopy density, number of days from full bloom etc. The rainy period prior to the second sampling date may have contributed to the differences in DM% between sprayed and non-sprayed areas, although the fruit was sampled more than a week after most of the rain and according to Currie and Nichols (2006), most of the effect of rainfall on DM% wears off after about a week.

The increase in TZI per week was higher for Zeroln sprayed blocks than control blocks on all three orchards (Figure 4)

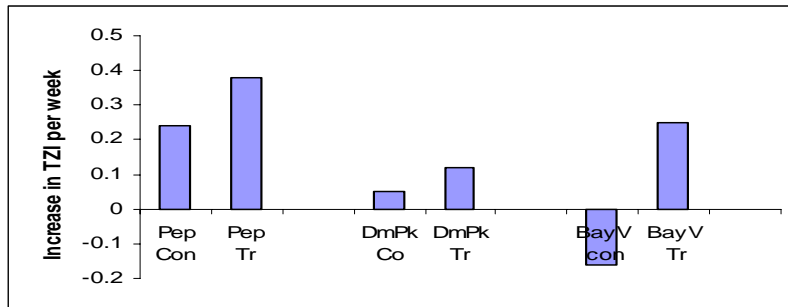


Figure 4. Increase in TZI per week for control and Zeroln sprayed blocks

Actual TZI levels are shown in Figure 4. These were higher for Zeroln sprayed blocks on all but Glencaroe orchard. At harvest time, samples from Zeroln sprayed blocks had a 34% higher TZI than those from control blocks from the Pepperpot Hort 16A orchard and a 48% higher TZI from Dominion Park Haywards orchard.

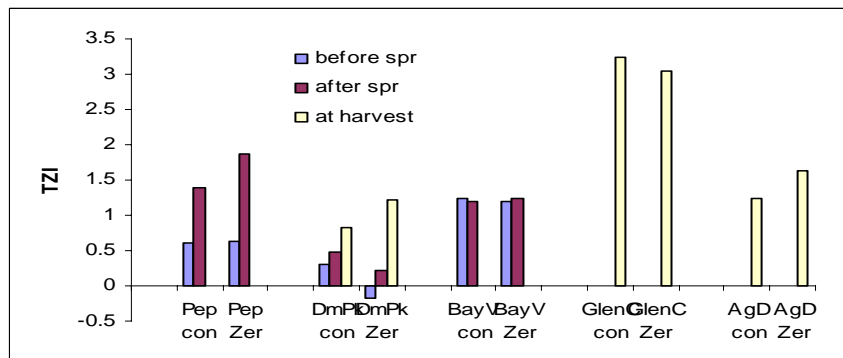


Figure 5. TZI for control and Zeroln blocks before and after spraying on five orchards

The final samples taken from the Dominion Park orchard showed a considerable increase in DM% and TZI in the last 20 days before clearance (Figures 5,6,7).

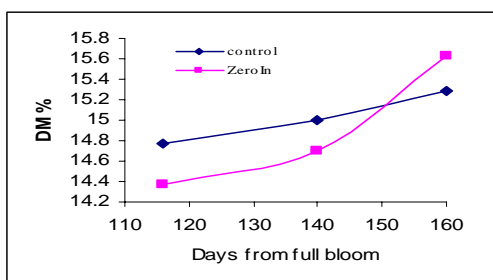


Figure 6. DM % at 3 sampling dates on control & Zeroln sprayed blocks, Dominion Park Orchard

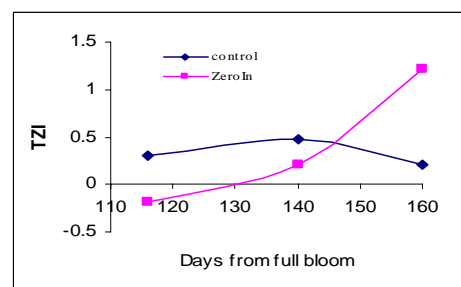


Figure 7. TZI at 3 sampling dates on control & Zeroln sprayed blocks, Dominion Park Orchard

According to SEEKA Technical Bulletin on dry matter, variability of DM% is generally higher at values for DM lower than about 18.5%. At lower levels of DM% any increase in DM% and decrease in variability therefore is likely to affect TZI and the prices paid. TZG was 18 – 35% higher for Zeroln sprayed blocks compared to control blocks. A rainy period about a week before the second sampling date may have contributed to differences in DM%.

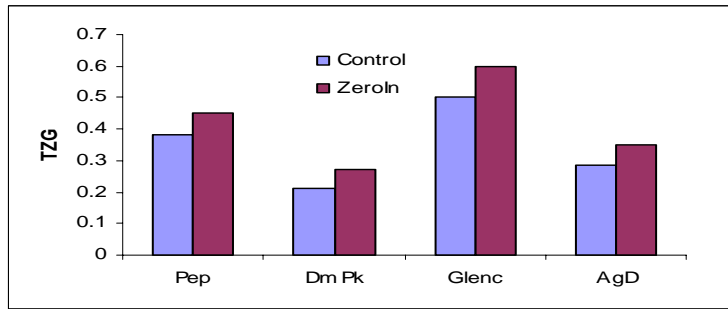


Figure 8. TZG of kiwifruit samples at maturity from control and Zeroln sprayed areas of 3 orchards

Taste Zespri Grade (TZG) values at maturity were consistently higher for Zeroln sprayed samples than for control area samples from the 4 orchards for which they were available. The increase in TZG was 18%, 28%, 20% and 35% for the Pepperpot, Dominion Park, Glencaroe and Agrodome orchards respectively. The Agrodome trials showed the control had a TZG of .285 and the trial block to be .348.

Brix and Colour

Mean Brix readings for samples from Dominion Park Orchard showed a smaller difference in soluble solids content between treatments (Figure 9). However, there was a larger difference between minimum Brix levels: on the control blocks minimum brix was 4.65 and average brix was 5.50 whereas on the Zeroln blocks minimum brix was 5.15 and average 5.59.

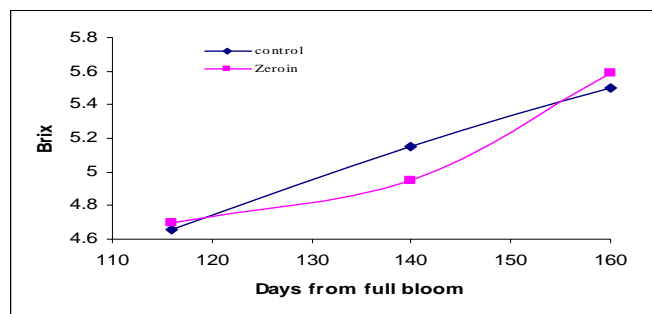


Figure 9. Brix at 3 sampling dates on control and Zeroln sprayed blocks, Dominion Park Orchard

There was little difference between Gold breaker Index in fruit samples from control and Zeroln sprayed blocks on the Pepperpot orchard.

Rainfall

For the first half of March there was little rainfall: from 1 – 15 March 11.6 mm and 19.1 mm were recorded in Tauranga and Te Puke respectively (Figure 10). There was then a period of rainfall, more in Te Puke than in Tauranga, before the second sampling dates in early April (see Table 1). For most of April there was only light rainfall, but few days with no rain. On 25 April, just before the last sampling date from Dominion Park orchard there was 51.3 mm rainfall in Te Puke.

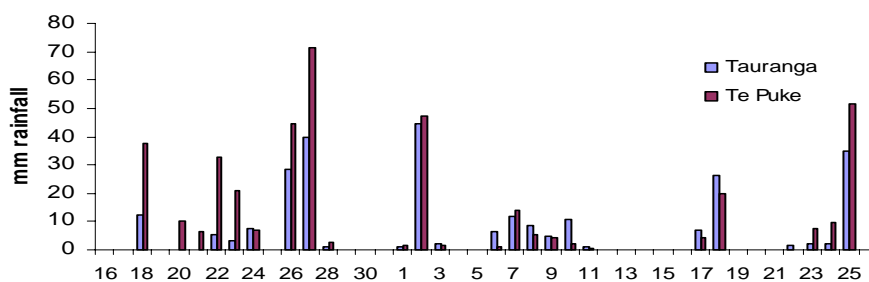


Figure 10. Daily Rainfall recorded in Tauranga and Te Puke during the trial period. (Rainfall from 6 am specified date to 6 am the following morning)

Total rainfall for March was 109.4 mm at Tauranga airport and 267.2 mm in Te Puke. April rainfall was 203.4 mm and 212.0 mm respectively.

Conclusions and Recommendations

From the data obtained it appears that Zeroln may increase DM% and decrease variability in DM%. This has a beneficial effect on TZI and TZG values. There may also be an effect on soluble solids (brix) levels. Statistically designed trials with the same spray and sampling dates on several orchards are needed to confirm whether this is the case.

References

- Currie MB, Nichols P. 2006 Heavy Rainfall effects on kiwifruit dry matter in May 2005 <https://www.zespricanopy.com>
- SEEKA Green and Gold Technical Bulletin 2004 Dry Matter The size of the future? www.seeka.co.nz