Improved Merlot flower set and bunch weights with the application of biostimulant Foliacin and Molbdenum

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Melot, Foliacin, Molbdenum, flower set bunch weight improvements

Background
As a result of earlier trial work in 2004-2005 involving both a major Hawkes Bay winery and Bio-Start, it was decided to lay down a number of new trials for the 2005-2006 year. Five vineyards were selected with different trial objectives for each vineyard.
The objective was to improve flowering and fruit set, and reduce splitting. A vineyard near Te Awanga was selected for this trial. AgConsult was contracted to do the trial monitoring and reporting.

The target variety in this trial is Merlot. Fruitset and yield in this vineyard have at times been disappointing. Merlot is a variety that is genetically predisposed to poor uptake of the trace element Molybdenum. Grafting onto rootstocks improves molybdenum uptake, but responses to molybdenum applications are still likely.

Molybdenum is a trace element that is required at very low rates. It plays an essential role in nitrate reduction (molybdenum is part of the enzyme Nitrate Reductase). Low levels of molybdenum can result in an accumulation of nitrate nitrogen in leaf blade issue, while at the same time the vine is deficient in biologically available nitrogen for the synthesis of aminoacids and amines. The nitrates need to be reduced to ammonium N before the plant can synthesise the nitrogen containing compounds. Low vine nitrogen can affect flowering and fruitset.

Responses to foliar molybdenum applications have been reported in Australian and New Zealand trials.

Improvements to flowering, fruitset and yield have also been obtained with certain seaweed products and with Foliacin. Foliacin contains some of the seaweed components thought to be responsible for improved flowering/fruitset responses, as well as other beneficial components for flowering and fruitset.

Based on this, a trial was developed to investigate the effects of molybdenum and Foliacin applications on yield and bunch/berry parameters.

Trial setup

A replicated trial was set up by Dave Werrey and his staff (see property plan below). The site is at close to Te Awanga. Planting density is 3472 vines/ha (2.4 x 1.2 m), variety Merlot, 2 cane pruned.

Row	Bay 1	Bay2	Bay3	Bay4	Bay5	Bay6	Bay7
250	Buffer	Control	Buffer	Foliacin	Buffer	Moly	Buffer
251	Buffer	Moly	Buffer	Control	Buffer	Foliacin	Buffer
252	Buffer	Foliacin	Buffer	Moly	Buffer	Control	Buffer
253	Buffer	Control	Buffer	Moly	Buffer	Foliacin	Buffer

Application schedule

Date	Treatment	Application rate/vine
2/11/05	Molybdenum	0.024gm
2/11/05	Foliacin	0.4ml
10/11/05	Molybdenum	0.024gm
5/12/05	Foliacin	0.4ml

Vines were sprayed to runoff.
Just prior to harvest, sub samples were collected to determine yield, bunch weights, bunch lengths, and berry weights. The sub samples were collected by stripping one half of 4 or more vines for each replicate. Juice analyses were also performed.

Results

The yield results, and bunch and berry parameter results are shown in Table 1

	Bunch/vine	Yield per vine (g)	Average Bunch Weight (g)	Average Bunch Length (mm)	Average Berry Weight (g)	Berries per Bunch
Control	26.5	3025.9	114.8	164.1	1.62	70.7
Molybdenum	27.1	5169.8	190.7	175.6	1.78	106.9
Foliacin	25.5	3653.4	145.6	173.4	1.77	81.6

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There was a very strong increase in yield, mostly based on an increase in berry numbers, for the Molybdenum treated vines. The Foliacin treated vines also showed an increase in yield, again, mostly a result of increased berry numbers.

The number of bunches per vine was not significantly different between the treatments

The yield increase of the Molybdenum treatment was statistically significant at the 95% level.

Average bunch length increased by 12.5 mm in the Molybdenum treatment, and by 9.3 mm in the Foliacin treatment. Considering that the Molybdenum and Foliacin treatments increased bunch weights (larger bunches) this is not surprising. However, relative to bunch weights, the Foliacin increased bunch length more than the Molybdenum treatment. This has repercussions for bunch architecture, spray penetration and disease susceptibility, as is confirmed by the Botrytis assessments.

Average berry weights went up marginally for both treatments, but not enough to explain the increase in yield. Most of the yield increase came from an increase in numbers/bunch, especially for the Molybdenum treatment.

This is a clear indication that the treatments, in particular the Molybdenum treatment, had an effect on flowering/fruitset.

The number of berries per bunch in the Molybdenum treatment increased by 51%, the Foliacin treatment increased by 15.3%. Both treatments also increased berry weights (by 9.7% and 9.2% respectively).

The "yield per vine" results are based on the harvested grapes from the selected vines. There were slight differences in the number of bunches/vine. The Foliacin treated vines showed a slightly lower number of bunches/vine. The Molybdenum treatment showed a higher number of bunches/vine. One could argue that this is background noise. If we compensate for the small difference in bunch numbers, the yield increase would look as follows:

Yield per vine assuming equal bunches/vine

Treatment	Yield per vine (g)
Control	3013.2
Molybdenum	5029.5
Foliacin	3774.6

Sub samples of the harvested grapes were pressed and juice analyses performed.

Juice analyses Juice analyses

Treatment	Brix	TA
Control	21	8.15
Molybdenum	18.3	9.23
Foliacin	20.8	8.65

There were no differences in pH levels (not reported). Brix levels were significantly lower for the Molybdenum treatment. This no doubt is a result of the higher yield. The Foliacin treatment, despite yielding higher than the Control, resulted in a marginally lower Brix compared with Control.

TA levels of the Molybdenum and to a lesser extent the Foliacin treatment, were higher than Control.

The harvested bunches were visually assessed for Botrytis more than 24 hrs after picking. In our experience this 24 hrs delay when bunches are packed in containers can significantly

increase Botrytis incidence and severity. The levels reported are significantly higher than Botrytis levels in the field at harvest. However it is likely that relativity between the treatments is maintained to some degree.

Botrytis infection rates

Treatment	Avg % of crop affected by botrytis
Control	23%
Molybdenum	43%
Foliacin	10%

The results show, not surprisingly, that the Molybdenum treatment had substantially higher infection of Botrytis than Control. This is likely to be at least partly a result of the tighter bunches. The Foliacin treatment showed lower Botrytis than Control despite higher bunch weights. Foliacin, however, also has a reported effect on the vines ability to control Botrytis infections.

Discussion

The objectives of this trial: to improve flowering/fruitset/yield, have clearly been met by both treatments and in particular the Molybdenum treatment which increased yield by about 50%. This increase was mostly due to an increase in berries/bunch indicating the treatment had an effect on flowering and fruitset.

This is a very substantial increase, but by no means out of line with some molybdenum responsive trial work seen in other trials.

The Foliacin treatment has also increased yield, although not as dramatically as the Molybdenum treatment. The mechanism for this is not as clear as that for the Molybdenum. Our understanding is that Foliacin does contain some traces of molybdenum, but it also may affect the levels of free polyamines in the flowers (due to elicitor action).

The different mechanisms may explain why the bunch length relative to bunch weight is more favourable in the Foliacin treatment, the Molybdenum treatment has resulted in much tighter bunches.

The higher yields of the Molybdenum treated vines have reduced Brix levels in the juice. The Foliacin treatment showed only marginally lower Brix levels as Control despite an increase in yield.

The Foliacin also appeared to have reduced Botrytis. Molybdenum, possibly because of the tighter bunches, had much higher levels of Botrytis than the Control.

These results in our opinion warrant further investigation. Although the results clearly suggest the vines are molybdenum responsive, the substantial increase in bunch weights and accompanying changes in bunch architecture, may have implications on quality, both direct and indirect (Disease). This may need to be explored further.

The Foliacin, although not showing the same size in yield improvement, appears to have important secondary benefits in terms of bunch architecture, disease control and possibly quality (maintaining Brix despite higher yields).