Vineyard | Trial Sheet

Soil improvement after using the Biostart programme

Background

A Biostart soil and foliar biostimulant trial was undertaken with Accolade Wines at their Woolshed Vineyard (Wairau Valley), on a premium Pinot noir block with the aim of lifting productivity and wine quality.

These goals were measured and achieved over a four-year period, after which soil tests were conducted to understand the impact of the Biostart programme on the soils that contributed to the improvements seen in the vineyard.

Trial Description

The following Biostart biostimulants were applied over a four-year period starting in the 2018/19 season:

- Mycorrcin is a soil biostimulant that activates beneficial soil microbes, which stimulate healthy root growth and development leading to higher nutrient uptake, faster crop establishment and greater yield.
- Digester is a soil biostimulant that activates the soil microbes that breakdown organic matter from cover crops residues which recycles nutrients faster and improves soil structure.
- Foliacin is a foliar-applied biostimulant that helps with green leaf retention and leaf biofilm recovery after environmental or chemical stress.
- Compost from Wholesale Landscape, Nelson.

The trial continued for four years with Mycorrcin applied at bud break and with all weed sprays (2–3 per year), Foliacin

was applied regularly with all cover sprays throughout the season from bud break (7–9 application/season) and Digester applied in Autumn.

After three years of applying the Biostart programme the vineyard soil had improved to the point where compost could be incorporated into the soil. At the end of year three, in Autumn 2021, compost was applied under vine at 5 T/ha. In spring 2022 soils samples (150 mm deep) were taken across the vineyard trial to measure the impact of the Biostart soil programme.

Results

Improved soil organic matter and carbon

In 2022 after four years of regular application of the Biostart programme and a single compost application the soil OM and C has increased 25% and 24%, respectively, compared to the untreated soils (Table 1). These results indicate that an extra 7 T/ha carbon has been sequestered in the top 15 cm of the Biostart- and compost-treated soils: this equates to 2.1 T/applied ha (under the vines).

Table 1. Impact of the Biostart programme on soil organic matter and carbon content.

Test Name:	Standard	Biostart	Difference	%
Organic Matter (%)	4.5	5.6	1.1	25%
Total Carbon (%)	2.6	3.2	0.6	24%
Soil Carbon (T/ha; top 15 cm)	35	42	7.0	20%

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Table 2. Impact of Biostart programme on soil CEC, density, and microbial biomass.

Test Name	Standard	Biostart	Difference	%
Cation Exchange Capacity *(CEC; me/100g)*	13.6	16.0	2.4	18%
Volume Weight *(g/mL)*	0.89	0.86	0.03	-5%
Hot Water Extractable Carbon *(mg/kg)*	897	1,062	165	18%
Estimated Microbial Biomass Carbon *(mg/kg)*	143	164	21	15%

Increased Cation Exchange Capacity (CEC)

The capacity of the soil to store cations (CEC) increased by 18% in the Biostart-treated soils reflecting the higher OM content (Table 2).

Improved Soil Aeration

The soils in Wairau Valley are clay based and soil aeration is a major issue for soil function. Over the course of this trial the soil volume weight (density) was reduced by 5% indicating that soil aeration had improved (Table 2).

Increased Soil Biology

The level of microbes in the soil was measured using the Hot Water Carbon Extraction test that provides an indication of soil microbiology content of a soil. Over the trial the HWEC test was 18% higher reflecting the benefits of higher OM levels and better soil aeration (Table 2).

Improved Mineral Availability

The Biostart programme improved the availability of both anions and cations in the soils, this is despite the same fertiliser programme being used across both treatments for the duration of the trial.

The amount of total, available and mineralizable nitrogen was improved in the Biostart-treated soils, with an additional 24 kg N/ha (17%) of potentially available nitrogen (Table 3). There were similarly big increases (28–42%) in the amount of plant available phosphorus, sulphur and boron in the Biostart-treated soils (Table 3). These improvements in anion availability is attributable to a combination of higher soil OM and microbial numbers in the Biostart-treated soils as well as better aeration.

The levels of calcium, potassium and magnesium were higher (16–36%) in the Biostart-treated soils, as was the total base saturation, indicating improved cation availability for plant growth (Table 3). This helps explain the improvements in wine quality and yield seen in the trial.

Conclusion

The long-term use of the Biostart programme, and one compost application, has significantly improved the OM and carbon levels in the soil. This in turn has increased the availability of both anions and cations, as well as increasing the CEC, soil aeration and microbial counts of the soils on a commercial vineyard. These improvements in the soil biology contributed directly to improvements in the vineyard including greater cane size, improved and more consistent yield, greater vine resilience and better tasting wine.

Treated soil on the left and untreated soil on the right

Table 3. Impact of Biostart programme on soil anion and cation levels and availability.

Test Name:	Standard	Biostart	Difference	%
Anions				
Total Nitrogen (%)	0.21	0.25	0.04	17%
Potentially Available Nitrogen (kg N/ha)	124	145	21	17%
Anaerobically Mineralisable N (µg/g)	93	112	19	21%
Phosphorus (Mehlich 3; mg/L)	39	55	16	42%
Sulphur (Mehlich 3; mg/L)	24	31	7	28%
Boron (Mehlich 3; mg/L)	0.31	0.44	0.12	40%
Cations				
Potassium (Mehlich 3; mg/L)	80	93	13	16%
Calcium (Mehlich 3; mg/L)	1,169	1,596	427	36%
Magnesium (Mehlich 3; mg/L)	157	210	53	34%
Total Base Saturation	62	72	11	11%