

# Increased root growth and mycorrhizal colonization with the application of the biostimulant Mycorrcin

Gerard Besamusca AgConsult

June 2006

## Key words

Mycorrhizal colonization, Mycorrcin, root growth

## Overview

Trials are conducted at the Hardy's Padthaway Stonehaven vineyard. The object of the trial is to address some of the issues that are affecting vine health, vigour and production.

Soil here are compacted, and have high soluble salts (and in particular high sodium and chloride) levels. Vines (Chardonnay (top) grafted onto Riesling) have been losing vigour and are relatively low yielding.

Mycorrcin has been applied at 10 L/ha at budburst in 2003, and again at 5 L/ha in spring 2004. A second application of 5 L/ha was planned but was not applied. For the 2005-2006 season a new application schedule was developed, with 5 L/ha being applied in August 2005. To date, yield and quality parameters were measured, which generally indicated a positive response, but it was not possible to reach statistical significance.

Canopy density was measured which showed an increase in Leaf Area Index (LAI) as a result of the Mycorrcin treatment, further statistical analysis is required to establish the level of significance.

To examine what effect the treatments had on root development and mycorrhizal colonisation, root assessments were made and rootsamples were analysed.



A trench was dug to aid root assessment

## Assessment

On 20/9/2005 a visual assessment was made of vine rootgrowth. Using a Dingo with a trencher 40 trenches were dug. The trenches were cut along the row, 40 cm away from the vine trunk, extending from a point directly opposite the trunk to a distance of about 80 cm. The area closest to the trunk was overlaid with a piece of wire mesh, measuring 40x40 cm with 5x5cm quadrants.

For each quadrant the number of small and medium/large (> 5mm) roots were counted.

The trial has five replicates of 10 rows over five blocks (302, 304/303, 305/306). The trenches were dug in the same rows as were used for earlier monitoring (Rows 18 and 21 for the first plot, rows 28 and 31 for the second etc.). Earlier EM surveys showed significant soil variability. After discussions with the vineyard manager and technical officer it was decided only block 302 would be used for the assessment to limit the effects of soil variability.

Two trenches per row were dug, apart from row 41 (where the first trenches were dug on a trial basis), all trenches were dug in bays (panels) 5 and 17. Photos were made from each trench.

In addition to the visual assessment, rootsamples were collected (small roots only). The samples were sent to Hill Laboratories in New Zealand, from where Karin Watson (Biological Culturing and Testing) did the mycorrhizal assessments. During the time between sampling and analysis most samples had become partly covered with fungal mycelium.

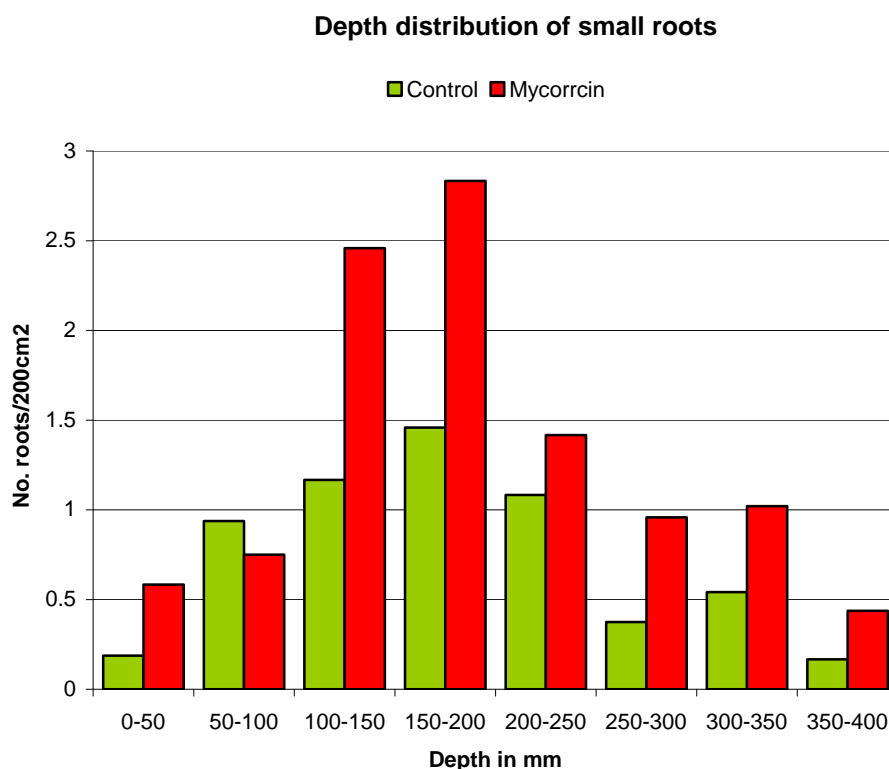
Roots were packaged per trench sample, but were later bulked up before mycorrhizal analysis per plot (four Subsamples per plot). However an assessment per sub sample was made for the average root diameter and for the percentage of mycelium covering the roots. The mycorrhizal analysis was done using staining and microscopy.



## Results

Almost all of the roots were between 50 and 600 mm, with more than half of the larger roots between 150-250 mm for the untreated vines, and 150-300 mm for the treated vines.

Smaller roots were more evenly distributed throughout the depth profile, but still tended to concentrate in 100-250 mm zone for the untreated vines and the 100-350 mm zone for the Mycorrcin treated vines (high rates of small roots were found especially in the 100-200 mm zone). The following graph compares the different treatments.



*Graph 1- Small root distribution*

The Mycorrcin increased the number of small roots by 73 %. The number of medium/large roots increased by 51 % but this was not statistically significant. (There was a high degree of variability in the results, probably due to the high soil variability.)

This resulted in a higher ratio of small to medium/large roots for the Mycorrcin vines (1.87 compared with 1.63 for the control vines).

No clear spatial pattern differences were found between the treated and untreated root systems (apart from the general increase in roots), although more statistical work will be done to further assess this.

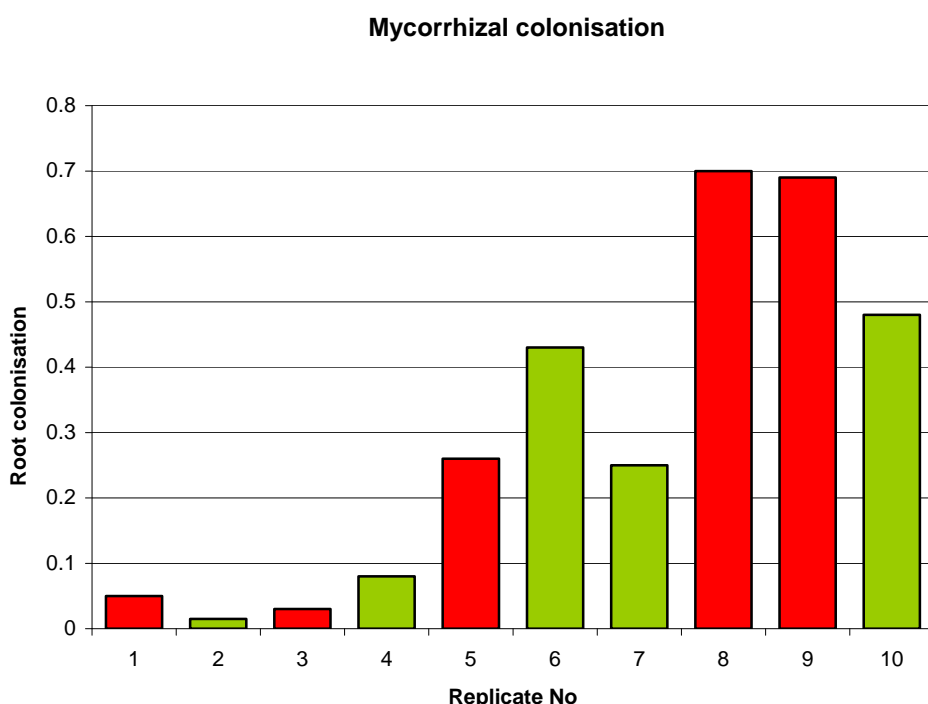
Average root diameters were assessed during the mycorrhizal analyses. It was found that average root diameter was slightly lower in the Mycorrcin samples (3.35 mm compared with 3.58 for the Control vines). This reflects the higher ratio of small: medium/large roots found in the visual in situ root assessment.

An assessment was made of the percentage of root covered by mycelium prior to washing and staining of the roots. The treated roots had slightly higher coverage (9%) compared with control.

After washing and staining, the samples were assessed microscopically, and scored for mycorrhizal colonisation incidence and density of the mycelium.

There did not appear to be a difference in incidence, but the treated roots had higher density of mycelium. The product of incidence and density was used as a measure of mycorrhizal colonisation.

Analysing the data, it became very obvious that soil variability is a major factor here. It appears that mycorrhizal colonisation parameters (especially density), was highly correlated with plot sequence. The plots at the start of the block had much lower mycorrhizal density than the ones at the other end of the trial site. This is shown in the following graph:



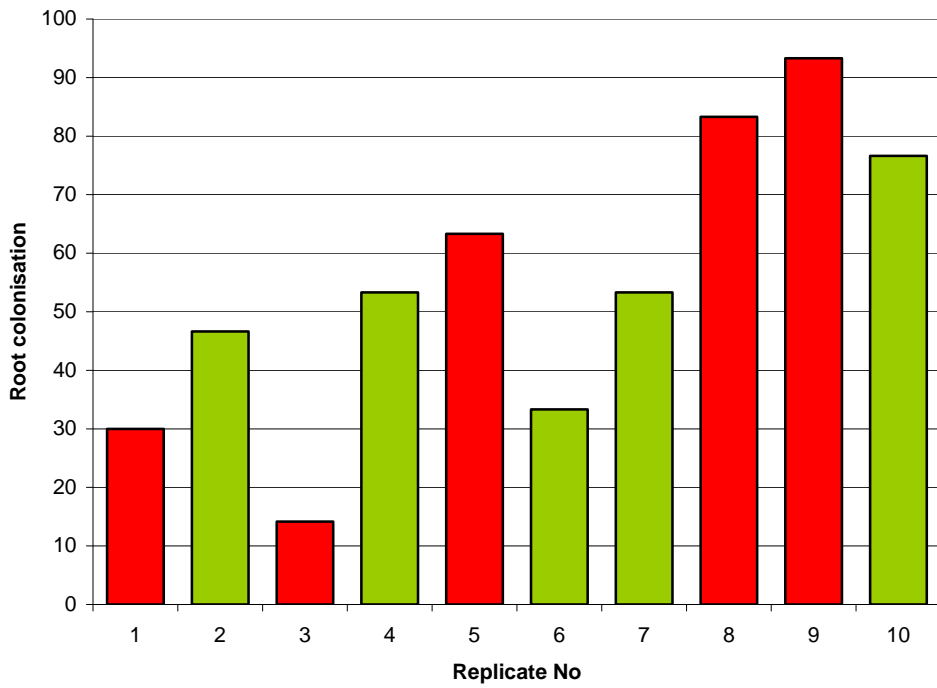
*Graph 2 Mycorrhizal Colonisation x density*  
Red is treated, green is control

Graph 3 shows the mycorrhizal data (excluding the mycelial density), and shows a similar but slightly weaker trend.

The plots with the lower row numbers show very low rates of mycorrhizal colonisation x density, whilst the plots at the other side of the trial show high rates of mycorrhizal colonisation x density.

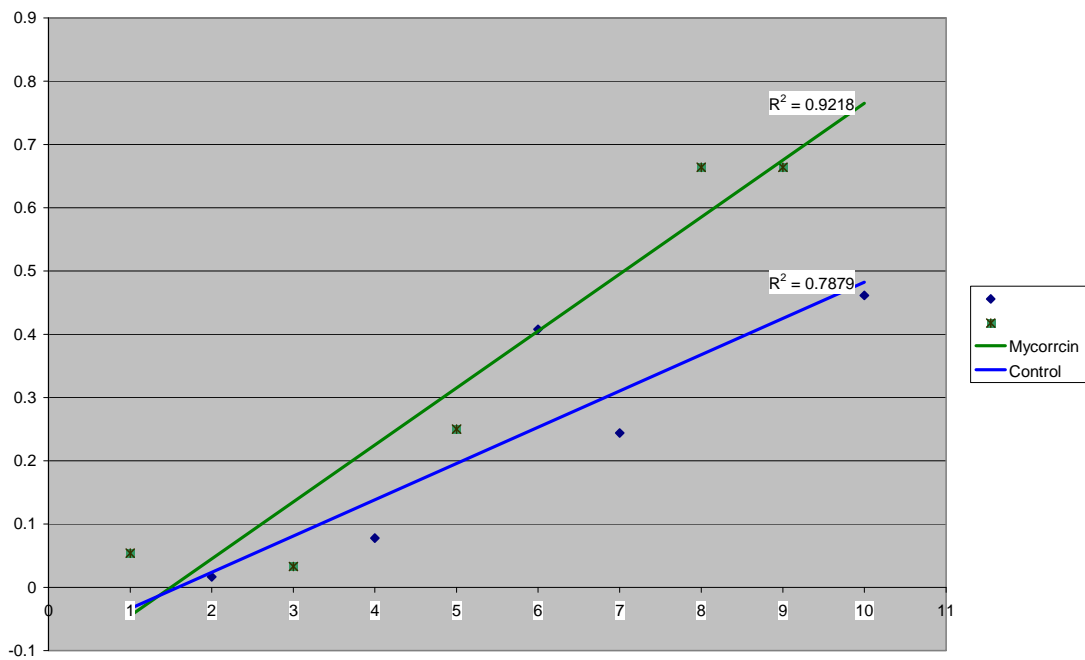
Although soil variability is high, there was no clear trend that emerged when the trenches were dug. Soil structure, texture and colour varied, but neither the visual observations nor the EM map presented results that support this data.

### Mycorrhizal colonisation



Graph 3 – Mycorrhizal Colonisation (incidence)

(Ecto) mycelium in the field (density x coverage) (replicate numbers at the bottom)



Graph 4 - Mycorrhizal trend lines

The effects of treatment may be best visualised in the previous graph (graph 4), where trend lines have been added.

## **Discussion**

Although more statistical work is required in relation to some of these results, the results to date indicate that the Mycorrcin has had a positive effect on root parameters.

The higher root density (especially of the smaller roots) is in line with other work done with the product. Increased root growth and increased lateral branching have been associated with Mycorrcin either directly or indirectly.

Improving rootgrowth and root structure was one of the aims of this trial. The development of the larger root system will have been a drain on photosynthate. In this light it is interesting to note that the Leaf Area Index results indicate a larger/denser canopy, despite this additional drain on photosynthate. It is possible that increased mycorrhizal status of the vine has improved photosynthesis.

The picture for mycorrhizal colonisation is more complicated, as that parameter appears to be much more affected by the position of the plot in the trial. It appears there is a trend for improving mycorrhisation across the row numbers. The high variability of this site makes it difficult to reach statistical significance (results did not reach significance), however the result suggest that Mycorrcin may well have promoted mycorrhizal colonisation here. More sophisticated statistical tools and analyses of individual sub samples rather than bulked up samples may help in this respect.