

September 11, 2008

I started using mycorrhizae in 1980. Our family owned Glass Mountain Forest Tree Nursery in the Napa Valley. What we were looking for was a larger healthier plant that would out perform the seedlings we had been growing since 1965. Once I inoculated the nursery seed beds, immediately I noticed larger healthier faster growing root systems and top growth. For us this was important because we seeded the nursery in April or May and harvested the bare root seedlings in the winter, January through March. We only had a short period in which to get the seedlings up to the specified sizes under contract to the lumber companies in California and Oregon. We noticed our cull rate went from 30% down to 10%, and the caliper of the seedlings all exceeded the minimum required 5-mm caliper and a 5 inch top. We immediately noticed greater financial returns on our net profits. We also found the fertilizers were working much better and were able to reduce the purchases by 35%. Our fungicide costs reduced significantly due to the fact that the mycorrhizae was naturally protecting the plants from disease. From a nurseryman's perspective and a Scottish banker for a Father things were looking up.

But what we found in later years when the trees were out planted in the forests of the Pacific Northwest was really where the benefits showed their prowess. The seedlings out performed

the rudimentary seedlings that were currently available at that time, and still today. In the forest there is no supplemental irrigation, only natural rainfall and soil moisture. When a seedling is planted in the forest it must immediately start to grow roots and follow the soil moisture down into the ground as the soil moisture dries up in the coming summer months. It is known as RGP or root growth potential. Mycorrhizal plants have roots that have a much higher root growth potential. So, our seedling out perform our competitors and our business grew from 200,000 seedlings in 1980 to 4.5 million by 1998.

The timber companies need to show a certain size tree in 5 years in the field as a requirement of their timber harvest plan. If they have small or inferior trees, they have to go back in and replant, this is a serious change to their budgets. The other factor that becomes exponential is the lumber companies need to show value of their renewed forests as soon as possible, because they can then show value to their balance sheets. The quality of wood in a healthy forest assures the owner of additional value in the pricing of logs for sale.

Experts from around the country came to our nursery looking for the secrets and reasons that we had ultimate success with the inoculation process. Through all these years Genesis Soils possesses the key to complete success to mycorrhizal inoculation. This is one of the main reasons that Genesis is ahead of its competition. Through time we have progressed into a true solution provider.

I was so overwhelmed with the health of the nursery stock that we were growing, I started to use the mycorrhizae in other plants besides conifer seedlings in 1984.

I performed a trial in a grape vine nursery in our area with VA mycorrhizae. I inoculated

2000 plants in paper pots known as Zip Sets. Also I left 2000 as control plants for the trial. The plants were growing in a greenhouse environment typical to the industry at the time. I received a call from the nursery owner with what appeared to be terrible news. The greenhouse had a power failure during an extended holiday, the greenhouse reached temperatures too high for any life to live for several days, no cooling and no water. I went into the greenhouse to view the plants and they all looked as though a blow torch had hit them, all dead, or so it appeared. I instructed the nurseryman to continue with watering the plants as though nothing had happened. After several weeks the inoculated plants were all green again pushing new shoots and visually recovering, however, the non mycorrhizal plants were brown and as it turned out through time was a complete loss. Now, we know about the benefits of mycorrhizae from a draught tolerance and resistance standpoint, but this result was so compelling that again, I was a believer even more so as to the benefits of mycorrhizal plants.

In another related trial with the same nurseryman but this trial was in his open fields with dormant root stock. We inoculated 40 long rows with our mycorrhizae at the time of spring planting. The growth was visually superior as I had previously experienced for several years. But what again was unbelievable was what happened when we went to harvest the plants in the field in the winter. The plants are harvested with a tractor that straddles the plant row, and has an implement known as a shaker assembly. It is an under cut blade with elongated metal fingers two feet under the plants that gently shake the plants and their roots from the soil and the workers then shake the rest of the soil from the roots and place the plants in bins headed for the packing house. All was going fine in the rows that were not inoculated with mycorrhizae, the tractor was moving just fine harvesting grapevines. When the tractor came to our rows of inoculated plants, the tractor stopped and started to spin its tracks and was unable to proceed. We hooked an additional tracked tractor to the front of the harvester tractor, and we were able to proceed with harvesting. The massive root systems were what was slowing the harvesting operation to a standstill. The mycorrhizal roots were three to four times the mass. That is also why the diameter of the vines were 50-150% larger than the control in the nursery. From a nurseryman's standpoint they were all # 1 select with less than 5% grading. As opposed to 40% # 1 grade, 30% #2 grade with the balance failing to meet size and root specifications. Yet another example of success.

The most dramatic responses are sometimes thought of as "snake oil", or the like by generally ultra conservative thinkers. Sometimes it is right in your face such as these prime examples, but people will not accept something that they do not understand or want to see it repeated for years and years sometimes never accepting the reality that it works for the one most simple answer; "The reason plant life is still on this earth for some 460 million years is because of the God given natural mycorrhizae to keep them safe". This product is 100% natural and organic, it is the higherarchy of all plant life with the ability to naturally combat disease through its antagonistic potential against disease, again as evidenced through time.

The next step that Genesis Soils has taken is to perfect the process of inoculation. Several companies produce spores that are supposedly so many per milliliter and they tout the quality of their product, only to be proven un satisfactory time and time again, It

is the quality of the product and the proprietary knowledge of how to successfully have infectivity. We have determined that not only are you growing a plant, but you must understand that you are growing a very delicate organism at the same time of juvenile growth in the nursery. One must understand how to successfully grow the mycorrhizae and its mycelium in order for it to be a success. Genesis Soils knows the secrets to unlock this phenomenon. Genesis not only has the knowledge, it now has found a source of the worlds best innoculum in our association with Dr. Mike Amaranthus. For all the reasons that I have experienced in my 28 years of application of this magnificent gift, I have seen so much that is positive and not one single negative. The key to the success is in the methodology of application. Fertilization regimes must be changed in order to grow the fungus. High nitrogen and high phosphorus will kill the fungus before it is able to attach and grow. Certain fungicides will kill the fungus also. For many years growers uneducated by the producers of products are let out of the box with nothing more than an invoice and a good luck. Failures have been the experience of too many people that have wanted to believe and understand the concept, but are not given the correct tools to use, thus failure and a bad name for the industry. Too many times the grower has been led down the garden path with new technology and new products only to be in essence used by unscrupulous salespeople. So, perhaps that is why the ultra conservative growers are wary, as they generally are the ones still in business. Genesis is different. I have been a nurseryman since 1965, and proud of it. At ten I was doing all the things that I enjoyed except I did not tromp 10 miles in the snow to get to school.

This as I call a "phenomenon", is truly amazing, I am learning more about its abilities every day. I am now deep in the "antagonistic potential against disease', that the fungus has the inert ability to combat disease. Just think, in our ever changing world of environmentalism, water quality, diminishing supplies, nitrate contamination, ground water contamination, etc., we now have an alternative that has been right under our noses for so many years.

Today after three years of trials and tribulations we are seeing the ultimate in our results, as evidenced by the photographs and field data that we have accumulated. These trials are specific to the grape industry because it is far more intriguing to me than horticultural crops. Grapes are very complex from the standpoint of what growers are doing to try and grow them. From the nursery the vines are sometimes what they are promised to be, sometimes virus free, sometimes, sometimes, sometimes! As a nurseryman this is totally unacceptable, certainly in the timber industry and horticultural industry, why not the grape industry. The reason is again the complexity of the plant. The root stocks have never been clean and free of virus and disease, the clones while are still untested through time, are all we have. Growers are doing an admiral job in working with the best that they have, but how many times have I seen vineyard failures after perhaps only 8-10 years old. This is a financial disaster, and has taken many very educated and savvy growers to their knees. So, how can we rise above this dillema through the technology we have available to us. Today foundation plant materials and groups such as this at UC Davis are now able to provide acceptable plant material that can be combined with desirable clones that help the grower with his desire for a marriage between his terroir and his target wine. The next step after so much cost and

trials and tribulations is to hopefully have them grow. This is where the rubber meets the road. Traditionally, and even today nurserymen are growing sterile plant material. The trend is to fertilize and fungicide. Fertilizers with high numbers, such as tripple 20, or tripple 16, or all the high caustic loads that the plant can take, naturally how can we get size and color to make specifications as a nurserymen to get them out the door and the cash in. Meanwhile high N promotes disease; fusarium, phytophthora, pithium. So what do we do, we hit them with fungicides to kill the fungus. Don't forget we also kill the good fungus too! What does the high non organic fertilizers do to the beneficial fungi that is trying to grow, it is also destined for failure, thus the black mark on the practical application of mycorrhizae discussed earlier. The plants are expected to go out into the elements simply without any natural protection, they are susceptible to failure. The vineyards are in my opinion being kept alive by force feeding NPK and other new combinations in as high amounts as they can take. Failing to ever look below the ground to see what is happening to the root systems that provide the growth to the plant. The roots are void of mycorrhizal activity simply because the growers, while unknowingly have killed the golden goose.

Today, my emphasis is on plant health that will deliver the highest wine quality available without stressing the vine into perhaps unrecoverable decline. We all want the grapevine to give us all it can from all aspects, but recently deficit irrigation practices are again stressing the vine into decline. Why are we talking about "hang time"? I prefer "hang em high"! Growers are wondering where's the beef when it comes time to review the weigh slips from the winery. Why are we selling grapes by the acre, not by the ton? Why are we even talking about this in earnest? Because the vineyards are going into decline and are in some occasions dying from starvation! Growers want compensation! Winemakers want the best fruit a vine can produce!

Mycorrhizal grapevines will allow the natural growth patterns to occur, they will stress and give the winemaker what he wants and even more because the vine is on the "healthy curve" of stress. The vine will store the water that it needs to recover during and after harvest, it recovers without damage. We call it stress relief. In the end, both grower and winemaker gets what they want, but not at the expense of the vine.

Disease suppression is our other area of application. As discussed earlier mycorrhizae protects plants from disease. Please refer to volumes of scientific published papers on this and all the other related discussions. Genesis has taken the scientific knowledge combined with our internal knowledge of methodology and further proved the benefits in real time.

Leaf Roll is the new Phyloxera, and a bit worse by some accounts. Scientific evidence shows suppression in the decline of leaf roll virus using mycorrhizae. We are presently conducting aggressive trials of young grapevines inoculated with mycorrhizae at first root elongation in the nursery to protect them at the onset into the vineyard that has a heavy load of virus contiguous to the vineyard. We want to see if infection will occur, if so at what rate compared to the controls, how it will effect the growth and finally will it matter if the vine has a limited or low infection to wine quality. These trials are currently ongoing and we will see results in 2009 and 2010. We know what the results are in New

Zealand and they are successful in grapes.  
Other crops cherries, potatoes, etc. have also responded in a positive fashion.

Genesis Soils is simply ahead of the curve and will always try to be, we understand the issues from the ground up, from experience.

Please take the time to read the several technical papers that relate to what our direction is that we are taking.

I must stress, (just kidding), we have gone beyond my wildest expectations of what this process is capable of doing for the long term health and viability of my very favorite industry.

"Drink up, enjoy"!

Bruce Coulthard