RAVE Goes Underground

This year's RAVE seminar focused on soils and roots, providing a tremendous opportunity to learn about this often neglected portion of the vineyard.

Mark Greenspan

This was a tremendous opportunity for us to get updated on the current research activities occurring below the soil surface.

Indeed there was. The case study vineyard was a roughly 10 acre Pinot Noir block that was planted in 1991 by a large winery. The vineyard looked to be a poster child for variability, a clear case study for a vineyard that was shown to be correlated with soil water content and mineral content, to begin with. The sensor, an EM38 from Geonics, in Ontario, Canada, was placed (or moved on a sled) throughout the vineyard block, and the apparent EC values were logged along with their GPS locations. They found that the spatial variation of the field capacity and that the electromagnetic sensor may be interfered with by steel vine stakes.

CORRELATING VINE GROWTH AND SOIL PROPERTIES

Dr. Jean-Jacques Lambert, assistant research soil scientist, continued the discussion around how soil properties and vine growth were correlated. He showed that vine size (measured using trunk diameter) was correlated to soil texture as well as to soil mineral concentration, including potassium, calcium and sodium. The correlations he described were significant but not eye-popping. One must consider that soil textural and mineral factors (and other factors) act both independently and together to influence vine growth and development.

Probably one of the most important factors, plant-available water content, was shown to be correlated with soil texture, namely clay content. While not a new discovery, it was important to show how variation in water availability will create variation in vine growth, and with it, management headaches.

Natural variability in available water exists for any piece of land, due to site geology in addition to processes such as erosion. However, Lambert was quick to point out that man-made influences may exacerbate the variability of a site rather than make it more uniform. The most heinous practices include grading of the land and ripping prior to planting. He said that grading of the land truncates soil profiles in the high spots and buries the natural profiles in the (formerly) low spots. Similarly, ripping destroys soil structure and creates artificial soil horizons, an example of which was shown by Lambert. Newer techniques, such as ripping only along the vine row with winged ripper shanks, produce the desired uniformity improvement without destruction of the soil structure.

ROOT PRUNING TO REDUCE VINE SIZE

Getting back to the “management headaches” that I remarked on above, if a vineyard is plagued by variability, it then must be managed. If not managed, the vineyard will never produce wines of high quality as I stated in a previous article. Dr. David Smart, assistant professor and program coordinator for this year’s RAVE symposium, added to the variability discussion by showing how the variation in soil available water had a measurable effect on vine water status. Some remedial measures were mentioned, including applying cover crops in “mosaics” to reduce vigor in some zones or tillage of cover crops to enhance vigor in other zones.

Smart discussed some work on root pruning of grapevines in order to restrict the volume of soil to selected vines, thus lowering their water status. Ostensibly, the idea would be to prune roots in vigorous regions to limit their growth. He showed that root pruning (simulated by hand and not by a ripper shank) did have the intended effect of reducing water status of the vines and also affected the desired reduction in leaf area. The results of this work are in press with the American Journal for Enology and Viticulture. He did stress, however, that this was a drastic proce-
dure and did not recommend that everyone run out and prune roots in vigorous portions of their blocks. Note that this practice has not been tested on a vineyard scale yet with regard to vineyard uniformity improvement.

THE IMPORTANCE OF MYCORRHIZAL FUNGI

Numerous other speakers spoke on topics outside of the realm of vineyard variability and precision viticulture. I cannot, unfortunately, discuss them all within the space of this column. But to continue on my soapbox about restrained soil disturbance during vineyard development, a pertinent presentation was made by Dr. Kendra Baumgartner, plant pathologist with the USDA. Her presentation was about the beneficial aspects of arbuscular mycorrhizal (AM) fungi in vineyard soil. Something that difficult to spell has got to be important, right? Actually, I was surprised at how important they really are.

The AM fungi live in symbiosis with plant roots, extracting carbohydrate from the roots while providing mineral nutrients to the host plant in exchange. The AM fungi send out long hyphae (fibrous masses) into the soil and can creep into pores smaller than those that plant roots can penetrate. Scientists have computed that it requires less energy for a plant to “feed” the AM fungi rather than to invest energy to produce their own root mass required to do the same job.

It is known that AM fungi are useful in taking up micronutrients as well as the immobile macronutrient phosphorous. Baumgartner presented research showing that they are also important for nitrogen uptake. AM fungi also colonize cover crop roots and serve as a “bridge” for nitrogen transfer from the decomposing cover crops to the vines.

That seems like a good reason not to “insult” the soil during vineyard development by fumigation. Fumigation sterilizes the soil, at least temporarily, thus eliminating or reducing the benefit that the AM fungi (and other microorganisms) provide to the vines. Fortunately, for those installations where fumigation is absolutely necessary, there are inoculants available that can speed the process of recovering the soil’s AM fungal population. Baumgartner cautions that the inoculants are viable organisms prepared by the manufacturer shortly before shipment. The products have a short shelf life, only about one month when properly stored.

If attendance was any indication of success, I’d say that this was the most successful RAVE in recent memory. I expect that most people in the audience left with a renewed sense that soils are not just dirt. wb

THE IMPORTANCE OF MYCORRHIZAL FUNGI

Numerous other speakers spoke on topics outside of the realm of vineyard variability and precision viticulture. I cannot, unfortunately, discuss them all within the space of this column. But to continue on my soapbox about restrained soil disturbance during vineyard development, a pertinent presentation was made by Dr. Kendra Baumgartner, plant pathologist with the USDA. Her presentation was about the beneficial aspects of arbuscular mycorrhizal (AM) fungi in vineyard soil. Something that difficult to spell has got to be important, right? Actually, I was surprised at how important they really are.

The AM fungi live in symbiosis with plant roots, extracting carbohydrate from the roots while providing mineral nutrients to the host plant in exchange. The AM fungi send out long hyphae (fibrous masses) into the soil and can creep into pores smaller than those that plant roots can penetrate. Scientists have computed that it requires less energy for a plant to “feed” the AM fungi rather than to invest energy to produce their own root mass required to do the same job.

It is known that AM fungi are useful in taking up micronutrients as well as the immobile macronutrient phosphorous. Baumgartner presented research showing that they are also important for nitrogen uptake. AM fungi also colonize cover crop roots and serve as a “bridge” for nitrogen transfer from the decomposing cover crops to the vines.

That seems like a good reason not to “insult” the soil during vineyard development by fumigation. Fumigation sterilizes the soil, at least temporarily, thus eliminating or reducing the benefit that the AM fungi (and other microorganisms) provide to the vines. Fortunately, for those installations where fumigation is absolutely necessary, there are inoculants available that can speed the process of recovering the soil’s AM fungal population. Baumgartner cautions that the inoculants are viable organisms prepared by the manufacturer shortly before shipment. The products have a short shelf life, only about one month when properly stored.

If attendance was any indication of success, I’d say that this was the most successful RAVE in recent memory. I expect that most people in the audience left with a renewed sense that soils are not just dirt. wb

THE IMPORTANCE OF MYCORRHIZAL FUNGI

Numerous other speakers spoke on topics outside of the realm of vineyard variability and precision viticulture. I cannot, unfortunately, discuss them all within the space of this column. But to continue on my soapbox about restrained soil disturbance during vineyard development, a pertinent presentation was made by Dr. Kendra Baumgartner, plant pathologist with the USDA. Her presentation was about the beneficial aspects of arbuscular mycorrhizal (AM) fungi in vineyard soil. Something that difficult to spell has got to be important, right? Actually, I was surprised at how important they really are.

The AM fungi live in symbiosis with plant roots, extracting carbohydrate from the roots while providing mineral nutrients to the host plant in exchange. The AM fungi send out long hyphae (fibrous masses) into the soil and can creep into pores smaller than those that plant roots can penetrate. Scientists have computed that it requires less energy for a plant to “feed” the AM fungi rather than to invest energy to produce their own root mass required to do the same job.

It is known that AM fungi are useful in taking up micronutrients as well as the immobile macronutrient phosphorous. Baumgartner presented research showing that they are also important for nitrogen uptake. AM fungi also colonize cover crop roots and serve as a “bridge” for nitrogen transfer from the decomposing cover crops to the vines.

That seems like a good reason not to “insult” the soil during vineyard development by fumigation. Fumigation sterilizes the soil, at least temporarily, thus eliminating or reducing the benefit that the AM fungi (and other microorganisms) provide to the vines. Fortunately, for those installations where fumigation is absolutely necessary, there are inoculants available that can speed the process of recovering the soil’s AM fungal population. Baumgartner cautions that the inoculants are viable organisms prepared by the manufacturer shortly before shipment. The products have a short shelf life, only about one month when properly stored.

If attendance was any indication of success, I’d say that this was the most successful RAVE in recent memory. I expect that most people in the audience left with a renewed sense that soils are not just dirt. wb


Previous columns:
- Avoiding Poor Fruit Set, Mar 2006
- Investigating the Relationship Between Yield and Quality, Feb 2006
- Hang Time: Wineries and Growers Seek a Common Ground, Jan 2006
- Taming Fruit Variability, Dec 2005

April 2006