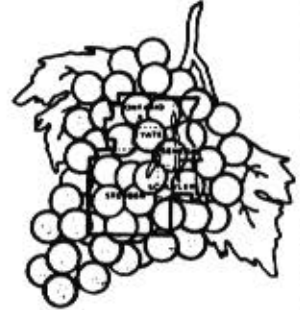




FINGER LAKES VINEYARD NOTES
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NITROGEN FERTILIZATION

David Peterson

Nitrogen fertilization has been discussed at many meetings and in many publications over the years. Yet, the issues to consider often seem inexhaustible. There continue to be many reasons to discuss it. After all, it is the most applied fertilizer in Finger Lakes vineyards, and with increasing costs as well as ground water contamination concerns, we must fine tune practices to get the most efficient uptake, and to minimize losses.

Nitrogen losses from fertilizer applications occur by 2 primary means. These include leaching below the root zone and volatilization into the air. Some loss by each of these means is inevitable, but it is important to plan a program to minimize the losses. Unfortunately, there is no simple means of predicting how quickly the nitrogen that you apply will move through the soil profile. There is some leaching loss with each rainfall event that occurs. The soil moisture content itself affects movement of nitrogen. Nitrogen applied as ammonium nitrate and urea (the most

commonly used sources of nitrogen fertilizers in area vineyards), is quite soluble and can quickly move through the soil. Urea, though initially less soluble than ammonium nitrate, is rather quickly converted to ammoniacal forms and then nitrified, and it too can be readily leached. Greater leaching occurs in wetter soils, since the soluble nitrogen readily moves downward in the soil water under these conditions. A series of small rainfall events also results in more leaching than one larger event, even if the amount of rain is the same.

Volatilization is the gaseous loss of nitrogen into the air. Losses may occur as nitrogen gas, nitrous oxide, nitric oxide and ammonia, and these losses can occur as the result of certain biological and chemical reactions that can commonly occur in the soil. Denitrification is a biological process by which the activity of several different soil microorganisms results in the conversion of nitrate to a gaseous form. Denitrification is greater under high soil moisture conditions and at higher soil pH.

Contrary to denitrification, some chemical reactions resulting in loss of nitrogen by

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volatilization are increased with lower soil moisture and at more acidic soil pH levels.

Surface applications of ammonium nitrate or urea may result in surface volatilization. Urea is subject to greater losses than ammonium nitrate, and is greatest at higher temperatures. As much as 20-40% of the total nitrogen applied may be commonly lost to volatilization.

To minimize leaching and volatilization losses, growers should carefully consider the following:

- 1) Avoid applying nitrogen when the soil moisture content is near saturation.
- 2) Apply only the minimum rate needed, and split applications into 2 timings if possible.
- 3) Apply nitrogen only at times when it will be available for uptake (see section that follows).

Vine uptake and fertilizer timing. This has been a much discussed topic in recent meetings and in my newsletter over the past several years. Research in recent years indicates that vines do not take up significant quantities of nitrogen from the soil until at least a few weeks after bud break. Early season demands for nitrogen come from nitrogen stored in the vine from the previous season. Significant uptake of nitrogen from the soil is unlikely to occur before mid-May in the Finger Lakes in normal seasons. Therefore, applications made in April are likely to be subject to extensive losses by all of the methods discussed above.

So what is the ideal time to make your application? There is no easy answer, since conditions (amount of soil moisture from late winter and early spring precipitation, rainfall frequency and volume in late April and May, temperature, growth rate and stage) vary from year to year. However, several important facts should be considered. First, it takes only a very small amount of moisture to move ammonium nitrate into the soil. Even dew will result in some movement. If there is significant soil moisture present at the time of the application, some nitrogen can be expected to move into part of the root zone with no rainfall at all. Grapevines are potentially very deep

rooted, but the greatest volume of roots is in the upper part of the soil profile. Many Finger Lakes sites also have quite restricted rooting zones. Average rainfall is about 3 inches per month in both April and May in the Finger Lakes, which is more than enough (if applications are made too early) to result in substantial leaching losses. I generally suggest making applications of ammonium nitrate no earlier than bud break, and closer to mid-May may be better than early May, depending on soil moisture conditions. Soils are rarely excessively dry in the first part of May, so getting nitrogen into the root zone is unlikely to be a problem. One caution, avoid applications close to bloom, as excessive uptake at this time can adversely affect fruit set. Splitting applications by applying one half to two thirds of the total rate in May, and the rest just after fruit set will likely increase the efficiency of uptake by vines.

Urea or ammonium nitrate? You may have noticed that I have referred to ammonium nitrate (as opposed to urea) throughout most of my discussion. Ammonium nitrate is generally subject to less total losses than urea, primarily because of its lower potential for volatilization. However, urea has a lower cost per unit of nitrogen, and this difference is likely to become even greater in the future. Therefore, many growers are now considering urea more than in the past. Urea can be a very good source of nitrogen fertilizer in vineyards, but greater losses due to volatilization are inevitable. As was previously pointed out, warm temperatures and high soil moisture content increase losses. Ideally urea should be incorporated, but unfortunately, this does not fit into the no till situation in most vineyards. Early applications help avoid the warmer temperatures that encourage volatilization, but soils are sometimes quite wet early in the year, which can offset this advantage. Early applications also result in some leaching loss, although the losses presumably occur more slowly than with ammonium nitrate. Therefore, avoid early applications under wet soil conditions. Accepting some volatilization loss with a later application (to a less water-saturated soil) is likely to be preferable to the combination of leaching and volatilization loss that would occur with an early application to a wet soil. In well drained soils that are not saturated,

however, applications of urea can be made in April before soil temperatures get warm. If the soil remains relatively wet through April, urea can be timed similarly to ammonium nitrate, but applications should avoid hot days and wet soils, and should be timed with an upcoming predicted rainfall.

In other crops such as wheat, the rate of nitrogen application is often increased by 20-25% when urea is used (as opposed to ammonium nitrate) as a surface application, to account for volatilization losses. The greater losses and potential need for a higher application rate should be considered when comparing the economics of using urea versus ammonium nitrate.

When using split applications, ammonium nitrate should be used for the late application. For varieties that do not appear to need much or any nitrogen to achieve adequate shoot growth, making a post-fruit set application only should be considered. This approach may be useful in many *vinifera* vineyards, where canopy yellowing (chlorosis) is common late in the season. Rates of sugar accumulation are likely slowed in chlorotic canopies.

Rate of application. This is perhaps the aspect of nitrogen fertilization that is the most difficult to make recommendations about, since so many factors must be considered. Soil nitrogen level, variety, potential crop load, leaf area, and losses due to leaching and volatilization, all are factors in determining how much nitrogen any given block of vineyard actually needs. Most Finger Lakes growers apply 50-100 pounds actual nitrogen per year. Native American and hybrid varieties are usually fertilized more heavily than *vinifera*, which is due at least in part to the fact that they are typically cropped heavier. Other differences are due to the varieties themselves, and *vinifera* are usually grafted to resistant rootstocks.

Experience is often the best guide in determining rate, as each grower should know their site and the need for increasing, maintaining, or decreasing growth (as compared to the previous season).

COLD HARDINESS UPDATE

David Peterson

After a mild winter with relatively insignificant bud injury throughout the Finger Lakes, there was much concern over the cold temperatures recorded on April 5 all along the East coast. The official low temperature was 15°F at Geneva, and we received reports in our office ranging from 10-18°F in other parts of the Finger Lakes. With mostly cool days the week preceding April 5, sap flow was minimal in most varieties at that time. Based on analysis of bud samples by Dr. Bob Pool's Lab on April 5 at the Geneva Experiment Station, the temperature required to kill 50% of the primary buds (LT₅₀) was 0 to -3°F for Concord, Cabernet Sauvignon, Chardonnay and Riesling. This would indicate that significant bud damage as a result of this cold is unlikely. The average LT₅₀ for April 7 at Geneva is 6°F for Concord, 2°F for Riesling, and 0°F for Cabernet Sauvignon, so vines appeared to be somewhat hardier than average. Concord is typically less hardy than many *Vitis vinifera* varieties at this point in the season, since it deacclimates more quickly.

WORKER PROTECTION STANDARD MEETING

Since this is the year that the Worker Protection Standard will finally begin to be implemented on farms, the Finger Lakes Grape Program will be sponsoring a meeting in cooperation with Canandaigua Wine Company. The program will be offered on Thursday April 13 in 2 locations. The Taylor Hammondsport farm will host the first meeting at 9:00 a.m., while the second will be at 1:00 p.m. at the old Gold Seal *Vinifera* Vineyard in Valois. Chris Daum of Helena Chemical Company, will go through the actual worker training procedure (workers needing training will get their cards for attending), Ed Hanbach of DEC will highlight the major points that you will need to know for 1995, and Tim Weigle of Cornell Cooperative Extension will discuss requirements (posting requirements, protective clothing, etc.) for specific chemicals used in the grape industry. **Attendees will receive 2 credits**

**towards pesticide applicator
recertification.**

To get to the Taylor Hammondsport farm, go through Hammondsport on Route 54A going north for approximately 0.2 miles past the Hammondsport Square. Bear left at the sign for Keuka Lake Wineries (Middle Road). Go 1.9 miles and there will be a large white building on the left surrounded by vineyards. Meet at the white building.

The old Gold Seal Vinifera Vineyard is located on Route 414 (just north of the old railroad overpass and a bed and breakfast inn) roughly 1 mile or so north of the town of Valois. Meet at the shop building located on the west side of the road.

STUDENT SUMMER SCHOLARSHIP

The Nelson J. Shaulis Advancement of Viticulture Fund, Inc. will make a work experience award to a Cornell University student in the College of Agriculture and Life Sciences for the summer of 1995. The goal of the award is to encourage students to enter the field of viticulture as a career by exposure to viticultural research. The award is for \$1900, and the awardee will participate in a summer work experience at the New York State Agricultural Experiment Station in Geneva under the supervision of viticulture faculty members. A housing allowance is also available for those in need. The student will register in an independent research course (3 credits) and will be required to engage in independent study during the summer as well as to submit a research paper on his or her study.

Applications are due on April 25, 1995. For an application form contact:

Secretary
Dept. of Fruit and Vegetable Sciences
134 Plant Science
Cornell University
Ithaca, NY 14853
(607) 255-4568

UPCOMING MEETINGS

April 13. **WORKER PROTECTION STANDARD MEETING.** Taylor Hammondsport Farm or Gold Seal Vinifera Vineyards, Valois. (Details in this newsletter).

April 24. **ITALIAN VARIETIES - A VINEYARD AND WINERY MANAGEMENT TECHNICAL SEMINAR** (Features Sangiovese, Pinot Grigio, Nebbiolo, Barbera, Tocai Fruilano and others). Flamingo Hotel, Santa Rosa, CA. Call: (800) 535-5670.

July 19-20. **"ALTERNATIVE WINEGRAPE VARIETIES" SYMPOSIUM** (Features Viognier, Sangiovese, Chardonel, Norton and other "alternative" varieties). In conjunction with the American Society for Enology and Viticulture Annual Meeting on July 21-22. Omni Hotel, Charlottesville, Virginia. Contact: Dr. Tony Wolf, Virginia Tech, 695 Laurel Grove Road, Winchester, VA 22602 Tel: (703) 869-2560, or Dr. Don Splittstoesser, Dept. of Food Science and Technology, NYSAES, Geneva, NY 14456-0462.



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