



# The Community Orchardist

February 2013

Michael Phillips, Editor

Can you feel it coming? I sure do. The sun reaching that wee bit higher each day. Chickadees calling out *'phoebe'* as these cheery birds turn to pondering territorial bounds. And fruit buds undoubtedly swelling in warmer places. The growing season beckons even as some of us shovel out from major snow. I've always enjoyed that long lead-in to seasonal change, almost as if there's a whole season in its own right between winter to spring. These are the days for meeting up with fellow growers, reviewing last year's strategy with a discerning eye, and setting aside funds for a proactive farm budget. Tree orders can still be made but choices whittle away daily. More than anything, make this the year to truly invest in a rich fungal duff. Moving our orcharding from constantly dealing with biological and nutritional deficiencies - what some folks call pests and disease - involves learning an entirely new language of health. Stir that biological stew, give heft to those competitive microbes, reap the right nitrogen in the rhizosphere. How can we be anything but excited about doing things well in 2013 !

## ***Tracking Tree Health thru Brix***

The storyline goes something like this:

- The photosynthesis process creates sugars through carbon fixation.
- Nitrogen combines with these carbohydrates to create proteins.
- Complete metabolism limits soluble amino acids attractive to insects.
- Surplus energy enables the storage of lipids and fats in plant cells.
- Essential oils and other phenolic compounds drive disease resistance.

Eco-ag thinkers have long held that if ~~by~~ everything is right+with respect to balanced nutrition and a functional biology then the grower can indeed find *Shangri-La* in his or her orchard. That pests and disease do not necessarily need to be the challenges we make them out of be. That the real investment a grower needs to make is in soil mineralization, foliar nutrition, and the right biology.

Raise your hand if you're a believer ÷ just as I expected. Codling moth and crew have you convinced otherwise, eh?



And yet we all realize there is something to this. Healthy function of plants often falls short. This is when disease can run rampant and insects choose to attack. The knowledge we seek

lies in understanding plant metabolism far better and accordingly becoming growers that invest in this beautiful green reality. Getting fertility ratios right in our soils is part of this. Foliar feeding a full and balanced range of trace minerals and unsaturated fats is part of this. Facilitating nutrient exchange in the root zone through fungal allies vested in ammonium nitrogen-delivery is part of this.

Plants create complex sugars and complete proteins best when all the requisite minerals are available. The concept of %photosynthesis efficiency+now being promoted for forage crops goes far in driving this point home. Insect pests appreciate that so many of us do not grasp this principal. The other words to hone in on in this story are %surplus energy+and herein lay the magic of fungal duff stewardship beneath our trees. All that woody organic matter being consumed by a diverse range of fungi results in more developed forms of plant nutrition available to feeder roots. Hear this. Absorbing soluble ions is one thing . any conventional fruit tree does that . but it is the fungally-connected tree provided this leg up nutritionally that has energy enough to produce greater amounts of terpenoids and isoflavanoids and all those secondary plant metabolites that keep disease pathogens at bay.

This is the basis of the holistic approach. And there is a way we can measure the madness of our methods. Let's start by having the BioNutrient Food Association **explain Brix** through this insightful introduction to the concept. Strong plant sap is a good indicator of improved metabolism. We will be emphasizing this technique in the coordinated research plans now underway for holistic growers. A refractometer can be gotten from **Pike Agri-Lab Supplies** if you want to dabble along. Lastly, just to stir the imagination, meet Bob Wilt, an Oregon blueberry grower, with his own **beyond organics perspective** about the benefits of nutrient dense farming. The man does not have the problem his neighbors do with spotted wing drosophila. His berries have a brix of 20. Ladies and gentlemen, the defense rests its case.

## ***The Lady Gaga Effect***

Okay. This is bad. Very bad. Yet helpful for folks in truly understanding the action of pure neem oil on insects. This is one of the fun analogies I use in my orcharding classes, all intended to drive home useful understanding.

Azadirachtins, being tetranortriterpenoid compounds found only in neem, closely mimic the hormone ecdysone, which is necessary for reproduction in insects. When present, this grouping of constituents takes the place of the real hormone and thus disrupts not only the feeding process, but the metamorphic transition as well by disrupting molting. It interferes with the formation of chitin (insect skin) and stops pupation in larvae, thus short-circuiting the insect life cycle.



Here's another way to think about that. You're a teenager once again. Twelve or thirteen years old. You play a certain kind of music on your iPod. And that's okay for you're bound to outgrow it. You'll move on to the Grateful Dead, maybe Ella Fitzgerald, maybe Sting and the Police. Those days of listening to Lady Gaga and Britney Spears and Justin Bieber will come to an end. As such things should. But now your space has been sprayed with neem. What happens? You can't turn off that music. It goes on, repeating itself for days on end. You in turn can't develop. You're stuck as a young teenage instar ♂ and after about 9 to 12 days of this ♂ you simply succumb. That's how pure neem works on juvenile insects.

The molting cycle marks that progression from egg to larvae, on through a specified number of instar stages, reaching pupation, and finally adulthood. Neem has little impact on curculio because this pest is an adult when it does its dastardly deed. On the other hand, the entire moth complex is quite exposed to %gagagazation+, in fact, phenomenally so. I use pure neem oil for a number of reasons in the holistic orchard, from its fatty acids to inducing systemic resistance to a deep-reaching impact on certain pests like borer. Yet little would anyone suspect what was actually going through my mind until now.

### ***That Vf Gene Sure Gets Around***

Most of the scab-resistant apples in the world have origins leading back to the PRI plant breeding program, a collaborative effort between Purdue University, Rutgers, the State University of New Jersey, and the University of Illinois. Efforts to breed scab-resistant cultivars began in 1926 when the Vf gene from *Malus floribunda* 821 was first bred into commercial apple cultivars. Nearly 90 percent of the scab-resistant varieties that have been released to date since then feature this singular Vf resistance gene.

The resulting cellular hypersensitivity works this way. A scab ascospore lands on a leaf or a fruitlet during a rain event. Surrounding moisture enables that pathogen spore to produce certain enzymes which in turn facilitate hyphal development. The disease needs to access food resources within a plant cell to survive. In the case of a so-called scab immune cultivar, that cell's response to pathogen penetration is to wither and die. Scab played its hand and now does the same. The result? No lesion, no infection, nice clean fruit.

But microbes are also clever . some might say even more so. The *Venturia inaequalis* fungi that cause scab have evolved in response. We learned this quickly in Europe where Vf cultivars failed to deliver against an entirely different race of the pathogen. The stage was set for change to come to North American shore by growers with scab-resistant varieties interplanted with varieties lacking immunity. The use of fungicides on only certain trees was an opportunity in the making.

Let's step back a minute to ascertain the surety of the breeders who developed these Vf cultivars. Names given to these varieties ranged widely but at the core was PRI, specifically Purdue University. You can see that in names like Williams' Pride, Enterprise, Prima, and Pristine if you step back and consider hidden acronyms.

*Venturia inaequalis* had a plan, and really wanting to make a particular point, it chose wisely. One of the first orchards on this continent to experience a new strain of scab and thus all the ramifications of this disease was at the Horticultural Research Farm in



West Lafayette, Indiana. The year was 2007 and aye, it was the floribunda mother tree itself at Purdue University. Scab-immune cultivars, it turns out, can be just as susceptible to the evolving races of scab.

"Unfortunately, just as reliance on a few fungicides has resulted in fungicide resistance, reliance on disease-resistant apple varieties in the absence of other management has resulted in the breakdown of Vf-based scab-resistance worldwide," reports Janna Beckerman of the apple breeding program at Purdue. "We've created a situation where all of our eggs are in one basket," she said, adding that reliance on a single Vf gene worldwide places tremendous pressure on this strategy.

Beckerman goes on to say that regardless of cultivar susceptibility, apple scab must be managed through the application of fungicides. For organic and sustainable production, it is important, even with resistant varieties, to rigorously apply fungicides during key scab infection periods to prevent primary infection when weather is cool and wet and the tissue is young and susceptible to infection. Applying one to three fungicide sprays to prevent primary infection in the spring should keep resistant cultivars free of scab for the entire season, she noted. She advised growers to avoid planting scab-resistant varieties next to susceptible apple cultivars to prevent any successful scab infections in susceptible isolates that could ultimately infect a resistant variety as well.



Take that for all its worth. I remain an advocate for planting the apple varieties you love and never limited my plantings in the Vf immune+ regard. All trees here at **Lost Nation Orchard** are managed holistically regardless of lineage. (Just saying fungicides are not the only option here, Janna!) Broader resistance is what truly holds promise in the long run in choosing varieties.

The cold-hardy Russian apple known as Antonovka has a suite of other genes that provide more durable scab resistance in some of its offspring (like the Freedom apple). Other cultivars like Akane and Sansa show similar polygenic resistance to the scab fungus. The apple pictured here is **Topaz**, probably the most widely planted variety in organic orchards in Germany for this very same reason.

## Deer Recovery Mode

New Brunswick grower Daryl Hunter knows ~~Deer Hell~~ in ways I never hope to witness. His explanation of the ~~dutch cut~~ points to a pruning strategy for replacing a destroyed limb stripped of its fruit buds and most shoots - provided a tree is young and vigorous and thus able to make a *now-protected comeback*.

The deer here are literally girdling the bark on small trees (8 to 10 yr old trees), trunks and branches, like a rabbit or porcupine would do. The older trees (20 to 30 years) are on standard rootstocks, a bit higher, and harder for the deer to reach, but by standing on their hind legs they manage to reach many of the tender tips and buds. The problem has gotten worse in the past decade. Originally, in the 70s when I started, I had only mice to worry about. . .



Normally, on a dwarf tree, with a branch that is badly cleaned of fruit spurs, I will nip off the terminal bud, or even a bit more and hope to get some new side growth on the limb. Usually, if there are some small uprights that haven't been nipped outright by deer, these will

claim the light space in the browsed zone. Sometimes I cut back to one of them. Also, it is possible to use a *dutch cut* on the limb in near the trunk and force an entire new branch from the angled cut. That's quite common with growers here. This can also be used when a branch is growing the wrong way and is too large to change its direction back to fill in the appropriate spot. A *dutch cut* will correct this by providing a supple shoot able to be trained.

Severe deer browse essentially converts young trees into ~~bush mode~~ in response to terminal bud removal on shoot after shoot after shoot. Trees can recover from such off-season browse but it will take two years of dedicated attention to get back to once was. Certain words earlier said it all: Trees in recovery require a *now-protected comeback*. Can you please tell me again why you thought you wouldn't need a deer fence?

*Only those who will risk going too far can possibly find out how far one can go.*

*T.S. Eliot*

## Network Support

Hearty thanks to the growers -- and those friends who want more good fruit grown locally . listed here. These are the folks who have stepped to the plate with financial support for this network since the last newsletter.

Our funding mechanisms are much like public radio: **You decide a pledge amount that works for you.** Click the blue and then you've done your part to keep the ball rolling. Part of every donation from here on in will automatically be designated to go to our Holistic Orchard Research Fund.

Stay in touch, think deeply,  
and treasure those  
venerable trees!

*Michael Phillips*

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