



The Community Orchardist

April 2010

Michael Phillips, Editor

I like ironies as much as the next guy. And I am choosing a bloom picture for this month's newsletter banner as it is that time of year. Yet right now, out my window here in northern New Hampshire, the view has changed overnight. The trees are still in early leaf heading towards bloom and I know the garlic is still out there a full eight inches high. . . but today all is white. We've had snow in the North Country. About eight inches in fact. It's thrown me off my game and into an indoor state of mind. Good does come of all things for here's some orchard musings for you to read at the height of spring busyness. Enjoy!

Using Biological Health to Abate Tree Fruit Disease

All growers likely can agree that "orchard health" implies building some degree of innate resistance on the part of fruit trees to fungal and bacterial disease. It's a concept readily understood with respect to our own bodies, after all, when germs come on the scene and our immune systems respond accordingly. Nothing is ever guaranteed but inner fortitude is definitely a leg up. We're about to take a deeper look at how biological health in the orchard provides a similar advantage for our trees and what precisely we can do to steward certain helpful associations. What follows is not a rejection of mineral fungicides by any means but rather a whole new way of thinking about disease and the choices we make as organic orchardists.

Action Central

A scab ascospore erupts forth from pseudothecia on fallen leaves (from the year before) on a rainy spring day. Significant odds guide this harbinger of fungal disease to an unfurling leaf where prolonged wetness facilitates hyphal growth of the spore. Enzymes are required to "crack the cuticle" and thus access nutrient resources within a single leaf cell. An infection occurs if everything goes along for a long enough time (the so-called wetting period) and no biological processes or allopathic fungicides interrupt the pathogenic intrusion. Bacteria work openings in the tree's vascular system in a similar fashion.

Old School Organics

The traditional organic approach to defeating this disease plan utilizes copper early on, then various formulations of sulfur and/or lime sulfur. Copper works akin to a blunt barrier by unfavorably altering surface hospitality. Sulfur works as a protectant fungicide in altering solution pH thereby inhibiting the production of penetration enzymes. Lime sulfur brings an eradicant edge by actually penetrating the leaf tissue and thus whacking that hyphal start out of the ballpark if applied within the first 24 to 36 hours following successful wetting. All these mineral fungicides have significant impact on soil and arboreal organisms, return bloom, beneficials, yield, fruit finish, and perhaps even your happiness. We agreeably opt for compromise in using these medicines as rampant disease would be a far worse scene.

The Heart of Holistic

A number of tangents lie exposed in that ascospore scenario that suggest courses of action beyond the typical allopathic dose.

- Hyphal intrusion initiates production of secondary plant metabolites that provide a **systemic immune response** for the tree. This phytochemistry can be stimulated by applying certain plant extracts and foliar nutrients.
- Numerous other microorganisms play both a competitive role and a symbiotic role through **full arboreal colonization** of the tree canopy.
- Balanced tree nutrition can best be brought about by **fungal duff management** favoring beneficial fungal species.

I will be very brief on all three points here, relying on the majority of you to perceive what orchard ecologist George Bird at Michigan State University has been teaching for years. *Interdependent and interconnected networks of living organisms interact together to bring the overall system to a fuller or better state.* The question to ask now becomes what happens when we honor such wisdom?

Stimulating the immune response of the tree can be done by introducing the very compounds a healthy tree produces in response to disease presence. These so-called phytoalexins are various terpenoid and isoflavanoid compounds. . . which happens to be among the **attributes proffered by pure neem oil**. Similarly, the cuticle defense of the leaf which must be overcome by spore enzymes can be supported by boosting levels of silica. Fermented herbal teas of horsetail and nettle are premium sources of bioavailable silica for the summer months.

Sustaining critter health throughout the tree canopy requires that we understand what depletes arboreal colonization as well as what nourishes this critical holistic force. I utilize activated effective microbes (boosted by a molasses feed) to introduce “biological reinforcement” onto the scene—others choose to do this with aerated compost teas ala Elaine Ingham of the Soil Food Web—but the fundamental missing link by purists has been food resource reserves to keep the arboreal communities running in full gear. The fatty acids in unpasteurized liquid fish and pure neem oil are the fuel behind prolonged colonization.



Ecosystem relationships at ground level also have absolute relevance to how the tree stands up in the face of environmental disease pressure. Here we enter into **emulating the forest edge** with respect to fungal dominance of the soil microorganism community. Healthy fruit trees rely on both mycorrhizal and saprophytic fungi to access balanced nutrition which in turn creates that internal fortitude I spoke of earlier. You simply can't buy this kind of nutrition in a bag! Fungal duff management is all about feeding fungal allies through the use of woody mulches (read my lips: **ramial wood chips**) and those fatty acids of fish and neem dripping to the ground when sprayed to the point of run-off.

The Four Holistic Sprays of Spring

The establishment of a holistic approach to tree fruit disease begins with four health-supporting sprays early in the growing season. These fixings of orchard health consist of pure neem oil, unpasteurized liquid fish, and a diverse complex of microbes. This is primarily a nutritional brew for beneficial fungi that also happens to stimulate tree immune function. A competitive arboreal environment will ward off pathogenic disease all the more so when fruit tree phytochemistry is activated. The primary infection period for most tree disease is effectively straddled by these sprays. Yet there's more to this story. The nitrogen boost (from the fish) going into bloom will strengthen pollen viability and meristem development for return bloom. Foliage pests will be impacted by azadirachtin compounds in the neem which inhibit the progression of egg to larvae to adult. . . thus these holistic spray applications serve as a biological replacement for petroleum-based dormant oil as well. Early season moth cycles get disrupted, setting up "lesser generations" the rest of the season.

The timing provided here is based on apple bud stages but can be bounced a week earlier for stone fruit where other diseases have proven a concern.

- **Week of Quarter-Inch Green.** The soil is a *sleepy place* coming out of the dormant season, even after sap flow has begun in the tree. This first application works in part as a catalyst spray to get both soil and arboreal food webs engaged. Buds are showing solid green tissue, somewhere between green tip and half-inch green. Pick a warmer day than not within this time frame to thoroughly wet down the entire branch structure and trunk and ground surface within the dripline of each tree. Target any fallen apple and pear leaf piles from the previous fall to facilitate pseudothecia decomposition. Both the neem rate and the liquid fish rate can be doubled for this one application only as phytotoxic risk to exposed foliage is minimal.

- **Early Pink.** Leaf tissue has filled out considerably at the base of blossoms, with that first smile of pink revealing itself in the apple flower. We're still in catalyst mode as regards the trunk and ground but also tuned into the competitive benefits of arboreal microbe communities on the leaf and flower cluster surfaces. Don't wait too long for this as neem oil and effective microbes should never be applied directly on open king blossoms.
- **Petal Fall.** Spraying to the point of runoff is now the name of the game, with lots of leaf and fledgling fruitlets to cover thoroughly. This is an important renewal spray as the bloom period may have been extended by cool weather. You will need to average what marks orchard-wide petal fall between early varieties that finish blooming well before later varieties. Weather plays a big role in this interpretation as rain "tickles the fancy" of pathogenic fungi especially at this moment in the season. Timing here is a dance between the need to potentially smother excess bloom (via the fatty acids) and interject a sulfur application (if necessary for more susceptible varieties) after the holistic application because of a "guaranteed" major spore release.
- **First Cover.** Ditto. But wait. . . some of you may not realize what an orchardist means by the term *cover spray*. This marks 7 to 10 days following the petal fall application. Spray strategies for certain pests (particularly the use of refined kaolin clay for curculio) overlap at this time—bringing the concept of multi-faceted nuance into full play.



Community Orchard Rates

This assumes a hundred gallon spray tank capacity to cover one acre of trees. A half gallon of pure neem oil mixed with a quarter cup of soap emulsifier mixed into 100 gallons of water achieves a phyto-safe 0.5% neem oil concentration. Two gallons of liquid fish and one gallon of *activated EM* completes the brew.

Home Orchard Rates

This assumes a four gallon backpack sprayer is used to cover so many trees to the point of runoff. Mix 2.5 ounces of pure neem oil with a generous teaspoonful of soap emulsifier to achieve a 0.5% neem concentration. Use 10 ounces of liquid fish and one ounce (4 tablespoons) of *EM mother culture* for this backpack volume. Add a dollop of blackstrap molasses to launch those dormant microbes.

Please check out the [Grower Resource](#) pages for biologically-approved suppliers of the products mentioned in this article.

Surround takes yet another Corporate Bounce

The refined kaolin clay product used by many of us in the East against the ravages of plum curculio [is now manufactured](#) for a [Belgium](#) transnational [company doing business out of Arizona: www.novasource.com](#). Research emphasis now centers primarily on reducing sunburn in dry western regions. What happens to pricing with Surround will become very interesting in the years ahead. What will your alternative approach be if this recent “organic standby” no longer proves to be readily available as a barrier repellent?

Question of the Month

I have been thinking about how to maximize the fungal component of compost tea. I missed out using mycorrhizal inoculants when I planted my trees, although I have used hormone rooting powders on some recent trees. Anyway, I plan to start my tea with rich vermicompost. I was considering adding either some forest floor earth or some other microbe/fungi product seen on the Internet. Any ideas?

Maximizing fungi in compost tea by providing certain food resources is definitely on the Soil Food Web agenda. This is not so much mycorrhizal species as it's about yeasts, molds, and saprophytic fungi however. Mycorrhizae and/or spores of same are present in the presence of roots... and garden compost doesn't necessary offer this, especially if it went through being turned and high heat build-up. Compost tea goals differ from inoculating the soil. You are right to recognize that healthy forest soil, especially if taken from the base of wild fruit trees (old enough to be naturally-inoculated and healthy looking to boot) will provide an indigenous source of mycorrhizae. I would not put this through a compost tea brewing process but rather sprinkle a quart or so of forest soil beneath woody mulch within the dripline of each tree to introduce the scooped-up spores and hyphal fragments into the root zone. Purchased inoculum may work after the trees have been planted but be sure it offers quality spores. The product from Bio-Organics that I have used is intended as a root dip just prior to planting out bare root stock.

Orchard Math

Natural predators are too often judged to be insufficient at providing complete control of a pest problem. What an appropriate moment to say *poo pah!* Dismissing helpful allies in the orchard ecosystem for not providing a complete solution on a species basis is exceedingly shortsighted and frankly arrogant. How much better it is to understand that several partial solutions add up to substantial biocontrol. And that this might just be diversity's way of doing higher math.



Let's consider the codling moth—most anyone anywhere will deal with this pest of apples, pears, quince, and even some apricots and plums. Eggs are laid singly in proximity to the developing fruit, often on a nearby leaf if not on the fruitlet itself. Each female moth will deposit 30 to 100 pinhead-size eggs. These sit exposed for 6–14 days before hatching. Certain parasitic wasps can sense precisely where and will lay their eggs inside each moth egg to provide a feed for

their young. Call that a 20 to 60 percent advantage. . . provided plenty of flowering diversity exists to support the presence of plenty of adult wasps. Just-hatched codling moth larvae have significantly better odds than most moth caterpillars, as this internal feeding species bores into the fruit generally within 24 hours. A spined soldier bug or an especially astute chickadee might have ended this passage. Still other parasitic wasps lay their eggs in the larvae itself to provide a feed for their young. Score that 5 to 10 percent given the short duration of exposure (the odds against surface feeding caterpillars rise astronomically, by the way). Codling larvae eat the seeds in the fruitlet and then exit some 3 to 4 weeks later, either by dropping to the ground in a fallen fruit or crawling back towards the trunk. Yellow jackets gather such caterpillar meat for their young. . . spiders weave, pounce, and otherwise frolic. . . ground beetles never let creamy flesh walk on by. Let's take away another 5 to 20 percent. Surviving larvae spin a cocoon in which to pupate beneath bark scales on the trunk or in a sheltered place at the base of the tree. Woodpeckers and nuthatches work this situation; tachinid flies aren't averse to sticking an egg within that cocoon to facilitate a pupal feast. That puts codling moth down another 10 to 20 percent.

Beyond *letting all this happen* by fostering biodiversity, our job on the insect balance front should be considered blessedly small in comparison! The advantages spoken of here apply to all pests to varying degrees. Spend some time getting to know your friends and revering their "limited contributions" in the big scheme of things.

*The greatest happiness of life is the conviction that we are loved
- loved for ourselves, or rather, loved in spite of ourselves.*

Victor Hugo

Building Momentum

Regular financial support is enabling me to be more regular in turn. The full potential of the **Holistic Orchard Network** will come into its own once we build real time momentum. Check out the **Boring Bit** for a constant update on our financial status.

Please consider becoming a **full-fledged member** in this work. The general public is ever so eager for the community orchard concept we promote. . . as evidenced by even **apple lovers helping to pitch in!**

Thanks go out to the folks below who made a network donation in the "prebloom season" of 2010. This funding allows the website to progress, enables modest holistic research, and helps Michael do even more orchard networking!

Chuck Shelton - FULL MEMBER
Don Engstrom - FULL MEMBER
Marsha Lindner - FULL MEMBER
Usha Rao - RENEWAL

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

Michael Phillips