

HEALTHY PLANT METABOLISM

An excerpt from *Mycorrhizal Planet*, by Michael Phillips

Healthy plant metabolism begins with a molecule of water, a breath of carbon, and light energy from our nearest star. The tangible science behind all this unlocks the righteous way to farm and garden, give honor to trees, and plain do right by this earth. Nothing has ever excited me more. A few core concepts set the stage for this exploration into plant health.



The dictionary tells us that *health* reflects the functional efficiency of a living organism. Primary metabolic processes for plants involve photosynthesis, respiration, and the synthesis of organic compounds needed to sustain life. Being sustained sounds kind of good, like bearing up under stress. Wherein enters the term *plant secondary metabolism*. These phytochemical pathways aid in the growth and development of plants, but are “not required for the plant to survive.” Hmmm. That parting shot is taught the world over in biology classes (and thus the quotes), yet what a dumb thing to say to a grower or an herbalist.

Reductionist science has gotten us into trouble before. The ensuing biochemistries of vascular metabolism play a pinnacle role in keeping plants healthy. A wide range of constituents are used as defensive mechanisms to ward off herbivores, pests, and pathogens. Some metabolites make leaves taste bitter, and can even prove toxic. Most notably, quite a number of these compounds not only trigger a resistance response, but become the means by which plants thwart fungal and bacterial disease. Plant hormones regulate metabolic activity within cells. Allelopathic interactions inhibit the growth of competitors. Pigments such as carotenes and flavonoids color flowers and, together with phenolic odors, attract pollinators. Another phenolic compound known as *lignin* adds stiffness and strength to cell walls. This complex polymer provides structural support to trees reaching upward to the sky as well as amber waves of grain rippling in the breeze.

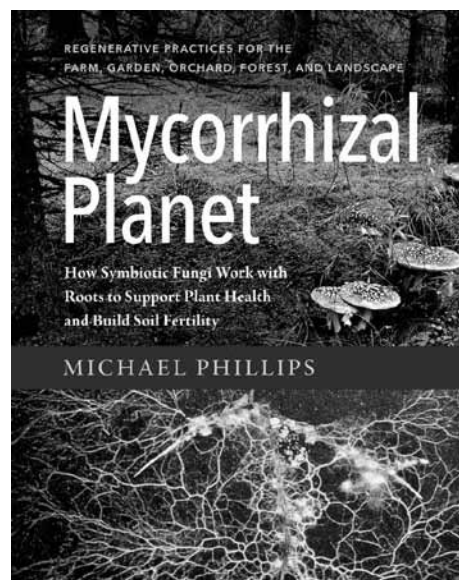
And yet, all such secondary metabolites are viewed as nonessential to the functioning of plants? Sounds like a plot to promote human intervention to me. Serious kidding aside, let's ponder for a minute what it means to be an unhealthy plant.

A number of things may go awry. Aphids crowd in to suck

plant juices. Moth larvae nip and tuck at new growth. Scab, rust, and blight spread mercilessly. Beetles skeletonize leaves till only veins remain. Mineral deficiencies abound. Bacterial canker and eye of newt. Rotting root and cauldron bubble. *Something wicked this way comes!*

Modern farming systems are regrettably unhealthy by choice. Fungicides, insecticides, and herbicides are no more than medications applied to compensate for practices that harm soil life. The resulting harvest may be “productive,” but the food itself lacks meaningful nourishment by half, and offers even less in the way of antioxidants needed by our bodies to ward off degenerative disease. On the other hand, dealing with countless symptoms spurred on by empty foods has become quite the boon for modern medicine. All comes round when we realize that parallels exist between human health and plant health.

Pests and pathogens encountered by plants should be considered “symptoms” resulting from a breakdown of natural defenses. Just as we humans have an immune system to ward off everyday encounters with germ organisms, plants have phytochemical abilities with which to face similar encounters in the green world. Plant resistance to insect feeding depends upon metabolic processes going the distance... along with an assist from beneficial insects. Plant resistance to pathogenic fungi and bacteria depends upon metabolic processes going the distance... along with competitive colonization on the part of friendly microorganisms from root tip to shoot tip. The prospects for such complete metabolism, of course, pivot on mineral availability and mycorrhizal collaboration.



Plants with full access to balanced nutrition provide a very different bill of fare for pests and pathogens seeking a niche to exploit. Our foray into a health perspective will assume a wide range of minerals are on hand in reasonable proportion. Later on, we will put

on our thinking caps to explore just what proper mineral investment might look like. Mycorrhizal fungi perform an

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important role in balanced nutrition as well. Select nutrients go to the host plant offering the better carbon trade. Sometimes the deal involves partially built proteins; other times it's trace mineral complexes from newly mined rock. The abundance provided every time one organism gives way to another frees up the profoundest offerings of all. This underground economy invokes ecosystem intelligence and an interdependence of species that we'll be marveling at shortly. Plants in turn take these elements and provide oxygen and sustenance for all who walk in beauty on this good earth.

We'll proceed under the unified banner of healthy plant metabolism. From here on in let's think of plant health in the affirmative. *Vibrancy. Vitality. Joie de vivre.* These are the words to seize the day and set our course aright.

Michael Phillips was the keynote speaker and workshop leader at Tilth Conference 2016. He is a nationally recognized orchardist and advocate for sustainable agriculture. His writing on the subject includes two previous books, The Apple Grower and The Holistic Orchard. Phillips' latest book, Mycorrhizal Planet: How Symbiotic Fungi Work with Roots to Support Plant Health and Build Soil Fertility, is available for purchase at GrowOrganicApples.com.

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for the movement?

First, I think we have to embrace all types and scales of organic agriculture. Anyone who is organic should be welcomed into the Tilth tent. It provides the perfect clearinghouse for information and policy work.

Second, it's incredibly important to support your membership organization. Farmers can also join their commodity association if there's a good fit. Your membership means that your stake in this movement is direct to the people who are championing our work.

And finally, staying up to speed is crucial. I know reading about the Farm Bill isn't as fun as looking at the seed catalog, but to know what is affecting you as a farmer, you have to know the landscape. It helps you take advantage of your local connections.

Q: Is there anything else you'd like to share with our members?

Tilth was my first avenue as a farmer, and it helped me find this larger community of organic and sustainable farmers. It made me feel like we were doing the right thing, and we're moving forward with solutions. We're using business and economy to revolutionize our movement. This movement is helping to solve the world's important problems like climate change and hunger.

Voices matter; my work doesn't amount to anything without farmers standing behind us. Farmers are valued and heard. We know that small change is hard, but that's the reality we live in. As your advocate, I ask for your patience and encourage open dialogue.

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were in ponchos, and folks were just clamoring for it all. It was a moment that I realize people in this city were driving change.

I think I've been to about 15 Tilth conferences over the years. I spent a lot of great times at those conferences talking, learning and networking with this community. It's the connections that make this community so vibrant. I want to do this until they find my nose in the dirt under an apricot tree.

READ THE FULL INTERVIEW WITH JERRY PIPITONE AT TILTHPRODUCERS.ORG.