

## Powdery Mildew, Pests and Other Gardening Challenges, by Deana Bess, M.Ed, FCHP

In April last year, I published an article about powdery mildew that was inspired by some issues members of the Collier Fruit Growers were having with mangos. Of course, as all gardeners know, nature has a continuous way of teaching us and when I was asked to share my thoughts again this year, I realized I had learned more from the lessons nature has offered me! In general, I look at my role as a gardener in an apprenticeship way, where I am the apprentice and nature is the teacher offering me the opportunity to learn about prevention and looking towards the roots of issues rather than just what's on the surface!

Powdery mildew is a fungal disease that shows itself as a white or gray growth on the surface of leaves and flowers. I find it occurs during cool but humid weather more often than any other time in our climate but interestingly enough, in other climates the fungus is known to prefer dry, drought-like conditions (Rateaver, 1993). I have read that simply spraying the plant down with water can help but I have not seen success trying that simple solution here in Naples. Now I understand more about why spraying water hasn't worked for me!

Choosing varieties of plants that thrive in our climate is the smartest decision one could make! Most of the plants I have seen with powdery mildew problems are not native to our climate and attempting to bend nature to my will by growing less tolerable plants has proven time consuming and frustrating. During the ten years I've lived in Naples, our climate tends to be quite unpredictable anyway! While environment is an important factor, I believe we experience a wide variety of pests and disease based on plant health, selection, and soil quality. What impacts the health of a plant is much to be debated but in general, I find success in looking to the soil.

Any time we see pests and disease, that plant is under stress for sure because nature's method is to eradicate the weaker species. Healthy plants require their own individual balance of water, sunlight, air, and nutrients. According to the Florida Nursery, Growers & Landscape Association, the ideal soil structure is 45% minerals, 5% organic matter, 25% air, and 25% water. So let's take a look at each of these essential elements:

- **Water:** So far in my experience with my own plants and helping others with theirs, the easiest and most common issue tends to be water. Whether there is too much, too little, or poor-quality water (chemicals, alkalinity, etc.), water problems can quickly create stress on a plant. Water impacts how the plant absorbs nutrients and when there is too much water, not enough air is available to the roots. When water is lacking, the photosynthesis process is disrupted, and the plant cannot make energy.
- **Sunlight (impacting the plant's ability to produce energy):** I can recall several examples where plant problems were resolved by choosing the right amount of sunlight for each plant; a relatively easy resolution if sunlight is either too much or too little. There are plenty of references to consult about hours of sunlight needed for each species. One of the blogs I read about powdery mildew suggested it thrives in cloudy conditions, but I haven't found a scientific reference supporting that.

- **Air:** In my experience, soil structure is an important component for improvement of plant health; FNGLA's ideal soil structure seems to be the best standard so far. In grade school science class, I remember our teacher showing us how to look at soil structure using a quart jar filled with soil and water; we shook up the jar and waited 24 hours for it to settle. The layers were clear, and we could see each level of sand (minerals), organic matter, and water (the air being replaced by water). While I'm sure that isn't a perfect method, and some may find it a bit inadequate, I believe it's simple enough to give us a good idea of the soil profile. I also tend to see specific weeds growing in areas where aeration is a problem in soil; nutsedge, foxtail, thistle, dogfennel, bindweed, nightshades, and peppergrass are common weeds I see that are primary indicators of soil lacking air (McCaman, 2013); our sandy soil tends to compact easily and adding organic matter and improving the soil biology helps reduce soil compaction. The heavy rains we experience during summer months can easily cause the soil to become anaerobic which is why aeration is so important. I also see wide-spread problems with the way plants are propagated and grown regarding burying the root flare. Some trees I purchase from growers have root flares buried so deep, I almost have to bare root the tree before I plant it. Dr. Garret writes extensively about this topic in his book, "The Organic Manual" and you can also read more about it on his web site ([www.dirtdoctor.com](http://www.dirtdoctor.com)). The trees I have planted correctly or exposed the root flare after the fact tend to be healthier than those that have a buried root flare.
- **Nutrients:** Powdery Mildew is caused by an imbalance of calcium, phosphorus, and vitamin C available to the plant according to Dr. Arden Andersen in his book, *The Anatomy of Life & Energy* (2014). The calcium and phosphorus are commonly understood, not so much with Vitamin C. The presence of the mildew indicates there is a problem with the plant's ability to produce Vitamin C, a substance that reduces plant stress. While I've not yet found anything concrete, it is my thought at this time that improving vitamin C involves a balanced soil microbiology. I come to this conclusion through several sources I have studied including Dr. Ingham's *Soil Food Web* information (2006), Lowenfel's *Teaming with Microbes* book (2010), Dr. Andersen's work, the teachings of Dr. Howard Garrett (known as The Dirt Doctor), and numerous scientific articles such as the Horticultural and Food Research Institute Laing and Bulley's (2007) article about what controls vitamin C levels in plants. I would simply add elements to the soil that improve the soil biology; a simple first step would be a good compost tea application containing plenty of molasses. Dr. Garrett said on a recent podcast that adding garlic tea to his Garrett Juice recipe showed excellent results. You can find more information about the recipes in *The Organic Manual* (Garrett, 2016) or on his web site ([www.dirtdoctor.com](http://www.dirtdoctor.com)).

Most people don't spend the time and money for a soil test and prefer guessing; this was my routine method until I realized how much time and money I was spending. Now I'm not saying we can't look at the plant conditions to make educated choices but to accurately diagnose an ongoing issue, testing is a critical component in my experience. Additionally, the soil tests where the results indicated the nutrients in the soil without their availability to plants were leading me down the wrong path and certainly not producing the results I expected. Last year, I discovered

information about the Reams soil testing that uses a combination of methods taking into consideration nutrient availability, soil structure, and soil microbiology (Andersen, 2007). So far, I'm very pleased with the results and customizing amendments based on facts rather than my former and expensive guessing methods.

In the case where guessing is the preferred method, and since it's typical that we have enough calcium in the soil here but it's just not available, I wanted to share some ideas:

- Try adding some Epsom salts (magnesium sulfate at 1 cup per 100 square feet) to the soil and watering that in. We commonly see a lack of magnesium availability in our soil; magnesium helps the calcium become available in plants just like it does in our bodies.
- Improve the soil! A healthy soil microbiology will encourage nutrient availability so adding quality compost (finished compost) and carbohydrates like dry and liquid molasses would improve the soil biology and thus the plants ability to absorb nutrients. I think many organic gardeners tend towards the idea that there can never be too much compost, but I find it important to remember that balance is more important and keeping to around 5% organic matter in the soil profile is essential. In my opinion and experience, unfinished composts and cool manures with shavings may be beneficial over long periods of time but in the short term, simply cause more problems because while that carbon material is breaking down, nutrients like nitrogen are used and needed by the biology but taken away from the plant which can lead to deficiency. If unfinished compost, mulch, or manures are applied, I think adding a good nitrogen source, like cottonseed meal, along with other soil building materials can help mitigate the nitrogen problem.
- I find compost routinely high in phosphorus and potassium and since there has not been a soil test but we know an imbalance exists from the presence of powdery mildew, I would add zeolite in an effort to bring the balance back. You can read more about zeolite in Dr. Garrett's articles in the reference section of this paper. I buy zeolite at Sutherlands General Store in the form of horse stall freshener called Sweet PDZ in which the single ingredient is Premium Grade Clinoptilolite, which is another name for zeolite.
- I would also add dry or liquid molasses to this area to feed the soil biology and likely improve the plant's ability to produce Vitamin C as a protectant against the mildew and other stressors. On a side note, since I started adding molasses to my routines around the garden, I see fewer fire ants, almost none as a matter of fact; you can read more about this topic on Howard Garrett's web site ([www.dirtdoctor.com](http://www.dirtdoctor.com)). I didn't believe it when I first heard it either but so far, it's been working for me!
- Spray the whole plant and soil with liquid seaweed at a rate of 1 ounce per gallon of water. Seaweed contains bio-stimulants that help reduce plant stress (Arioli, Mattner, and Winberg, 2015).
- Add calcium. While calcium presence may be shown in our soil, its availability to plants in an absorbable form is often low. Thus, it would make sense to apply calcium in the form of gypsum because carbonized calcium and limestone tended to increase alkalinity where gypsum did not in my experience. I used to apply bone meal, but after I started soil testing, I found that bone meal

is not available to the plant quickly like the gypsum. The areas where I have added the gypsum are showing great improvement. It is recommended for citrus soil to have about 3000 parts per million (ppm) calcium and mine is up to 2940 ppm.

Sprays of baking soda and sulfur, biologicals (like bacteria), garlic tea, 3% hydrogen peroxide, and corn meal tea are simply temporary, and I think beneficial to help the plant while working on nutrients; in the long run, choosing the right plants and addressing the soil biology and nutrients will reduce cost and labor and have potential to eliminate powdery mildew.

I always try to remember that spraying something to remedy a problem may keep sick plants alive, but it can also kill beneficial microbes and lead to a variety of unintended consequences. I personally don't want to eat from sick plants and would rather learn to hear nature's message and provide what is needed.

I hope you have found these ideas interesting and helpful; your constructive thoughts and comments are welcome!

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