



Learning from Compost



by Stephen Scott

Having been gardening for 15 years and composting for almost as long, we (my wife Cindy and I) quickly realized that with our climate and native soils, improving the soil's health and quality were the most important things we could do to help our garden. We are located in north-central Arizona, which is a semi-arid high grassland environment. Historically there would be 18-20 inches of moisture per year, but we have been lucky to see 10-12 inches in a good year over the past 20 years. There is almost always a southwesterly breeze which pulls moisture from any unprotected ground. The soils are varied in structure with many different types in close proximity to each other. It is not uncommon to have a good productive soil with a caliche or high sandy soil within 20-50 feet. Our garden is a good sandy loam, with decomposed granite about 30 feet to the east and a heavy clay caliche soil 20 feet to the west.

Good, aged compost has helped us build the health and fertility of our soil and overcome many of the challenges we face in our garden. It improves the soil structure and brings the micronutrients and biological life to the soil, along with earthworms and larger soil dwellers. Mulching the compost helps to retain needed moisture and brings the soil moisture level from about 2 inches down to the surface of the soil/mulch interface. We use a combination of straw and wood chips for our mulch.

There is much we have learned from reading *Acres U.S.A.* that we have applied to our approach in creating great compost, along with observations and education we have sought out along the way. We are happy to share some of our experiences and knowledge about compost.

We don't turn our compost, partly from being busy and not wanting to invest in machinery or equipment, also partly from research; reading and talking with those who have learned how to create some incredibly rich, earthy com-

post that looks like highly fertile soil. Most compost tumblers are too small for our needs and a tractor or turning equipment is an expensive purchase for occasional use.

Our compost piles age for at least a year before being added to the garden. We have learned that the slow aging is more beneficial to the decomposition process as well as not losing nearly as much nitrogen to off-gassing as happens with the hot and fast methods. Another benefit is the decomposition is much more thorough, destroying weed seeds, pathogens and any unwanted chemicals much better in a slower composting set-up. In our climate, we need to water our compost occasionally to keep it going. This is easy to gauge, as the rich earthy smell goes away when the moisture level drops. We water about every two weeks on average during warmer weather.

GLOBAL GARDENING

In our research and education of how to make great compost, we consistently saw traditional, proven methods from different countries, climates and approaches that worked. Many of them were very similar, adjusted to adapt to the particular environments of where they were used. The French intensive method used 3 feet of fresh horse manure and straw to heat the cold frames over the winter in Paris, then were pulled out and added to the compost piles to finish decomposing. In the fall the aged compost was added back to the growing beds for the upcoming winter. The Russian dacha gardening tradition shows how continuous composting and mulching with wood chips will improve the soil, overcoming both heavy winters in the north and drought conditions in the south.

Another thing that we found is that European traditions and older American traditions applied compost thickly, about 3-4 inches at a minimum, while modern gardening applies it rather thinly — like expensive imported mar-

malade on toast — and then we wonder why we don't get the results we expect.

After the year of aging and decomposing, our compost looks and smells like rich dark soil. This is especially pleasing to see in comparison to our pale tan native soils! Once we apply it to the garden beds, we mulch it with several inches of straw, watered well to keep it in place. Recently we have been experimenting with wood chips as mulch, with good results. The wood chips help retain and gain moisture better than straw, with the added benefit of attracting earthworms faster. The wood

chips act like a layer of permeable insulation, attracting the cooler and moist early morning air that sheds its water when it meets the warmer temperature of the soil. This moisture travels into the soil and is retained. It is surprising to see and feel how moist the soil is under 2-3 inches of wood chip mulch when there has been no rainfall or drip irrigation at all!

Our approach to making the best compost possible is to combine or "stack" techniques. We will walk you through the different techniques we use and why we use them.

We have used straw bales as the container for our compost system for years, but have recently started using shipping pallets to more effectively utilize the composting area. The pallets are almost three times as tall as the straw bales and will give more compost in the same footprint. Wood chips are put down first, about 3-4 inches thick. These help retain moisture at the bottom of the pile before it seeps into the soil, as well as helping to attract earthworms and adding nutrients as they break down. We will scatter wood chips throughout the pile as we add horse manure. The

Warm Fusion Compost

by Micheal Sunanda

I've been composting, mostly organic, for 20 years in many varied bioregions including Oregon, Washington, Hawaii, California, Australia, Bali, Mexico and Costa Rica. I enjoy focusing on gathering local biomass to co-create fertile, rich soil quickly using some imported amendments for growing food and herbs. I find I am constantly learning how nature works in each bioregion with the site-specific soil and gradually discovering local combinations of temperature, soil quality and local biomass for faster, richer compost.

My composting method has evolved into low-temperature, damp and shaded compost piles of varied size, shape and organic contents. I like this method better than hot composting that can kill enzymes essential for super-fertility, even in the tropics where composting is constantly happening in biomass day and night in soils. Faster or slower compost making doesn't necessarily equate to better fertility. It's easy to control composting temperatures with shade or coverings. I also cover to keep rain from drowning the compost, cooking warm, but not hot like some folks like it — even drying out.

Cold, or more accurately, warm compost works in winter when the ground is covered and warmer for covered composting piles with organic elements digesting organic matter into fertile soil. There's a hot debate for "hot composting" faster than in cold ground. But Nature is composting more underground than on the surface where rain, wind and sun are most intense. Often, enthusiastic composters stir piles for fast and hotter composting they believe is better, even using thermometers to ensure the pile is kept hot.

My "warm fusion" composting has evolved with patience and care, producing fertile soil that earthworms love to invade. I usually cover compost in summer sun and when it rains heavily to keep it damp and warm rather than flooded or hot. Most piles and pits teach me with soil biofeedback how fast and fertile they are working. Sometimes I add amendments including minerals, manure, green grass and leaves.

I enjoy hunting in nature for clay, manure, unsalty sand, seaweed and rich mud to add as needed. At a Punta, Mona Costa Rica, permaculture ecotourist site I quickly became the WOOFing composter, working and learning in the new jungle garden making compost from vast amounts of kitchen scraps. They had a covered, three-bin system common in most bioregions and added more than 20 pounds of kitchen scraps daily to the compost. I tracked the air temperature, soil depth and quality, minerals and microbes while turning the two piles daily. They were experimenting with a methane gas collector but failed to keep it digesting enough to cook with.

I enjoy hunting and collecting rich soil, herbs, seaweed, fallen fruit and some clay minerals for seeding compost piles and pits. I rarely add wood chips or paper which can suck nitrogen and slow down efficient composting, like brown leaves and newspaper does. I also add urine to compost to keep it damp and to add nitrogen. Most fertile soil microbes work in the dark and damp, not hot or dry. Damp warm grass and flower clippings usually work well when mixed with other elements, providing minerals. Every day I learn from composting.

In several bioregions I learned different ways and rates of composing local biomass into rich soil, like on the Hawaii Islands, but Punta Mona exceeded all my other composting in mass and speed of decomposition. We were able to use the compost much more quickly for soil for growing veggies in the next season garden. In the three-bin composter I used local soil, piles of food scraps, animal manure, a little beach sand, lots of rinsed kelp, a little clay and urine. I turned and transferred to the next bin for finishing. I also kept the piles damp, to keep microbes digesting. They produce an infinitely varied soil mix, depending on weather, organics, amendments, etc.

Each pile is unique, so I keep learning daily.

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nitrogen of the manure helps in the breakdown of the lignin in the wood chips, creating richer and more fertile compost.

Our two horses provide the bulk of the manure, along with the occasional load of cow manure. We are careful to get our cow manure from non-feedlot sources to avoid any contamination from antibiotics, glyphosate or industrial chemicals. This has supplied enough finished compost for our 14 30-foot long raised bed garden that is our home and trial garden for our heirloom seed business. We apply compost twice a year, mid-fall and early spring.

STRAW

Straw is used to mulch the top of the pile and provides aeration as more manure is added to the top. About 1-2 inches of straw is added across the top about every two feet of depth. This is continued as the pile grows in height. As the straw bales that make up other bins start to fall apart, they are added to the new piles.

MILK & MOLASSES

Milk is diluted 50/50 and sprayed onto the pile to help feed the microorganisms and jump start the decomposition process. The amino acids, proteins, enzymes and natural sugars that make milk a food for humans and animals are the same ingredients in nurturing healthy communities of microbes, fungi and beneficials in your compost and garden soil. Raw milk is the best, as it hasn't been exposed to heat that alters the components in milk that provide a perfect food for the soil and plants, but any milk will work. Using milk on crops and soils is an ancient technique that has been lost to modern industrial agriculture.

Molasses adds readily available sugars to the compost that will skyrocket the microbial activity, with the addition of needed mineral content. We use one cup of molasses to a gallon of water and spray onto the pile once it is about 1-2 feet tall.

COFFEE GROUNDS

Coffee grounds are added routinely as the pile builds to help with moisture retention and buffer our alkaline soils. Traditionally, coffee grounds were seen as an acidic addition but recent research

shows that coffee grounds act more as a buffer, moderating either an acidic or alkaline pH toward a more neutral one. In arid regions coffee grounds can be added up to 25 percent by volume of the pile. They are a good nitrogen source to help keep the decomposition going as well as being a natural earthworm attractant! Sourcing the coffee grounds comes from local coffee houses, restaurants, etc.

CHAR

Hardwood lump charcoal or bio-char is added as the pile grows to help the compost in many ways. The most obvious benefit is to add carbon to the soil. Charcoal has a lifetime benefit of several hundred years, as shown by Brazilian university studies on the Amazonian "Terra Preta" sites in the rainforest. It must be hardwood lump charcoal and not briquettes, which are processed with chemical fire accelerators, sawdust and other industrial waste. We like to crush it to about the size of a grain of corn to increase its surface area and effectiveness.

Charcoal acts like a sponge for the first six months or so, absorbing minerals and nutrients from the surrounding soil or compost while it "charges" or "activates." After that it becomes an active beneficial component of the soil, providing housing and food sources for the microbial communities. Mycorrhizal Fungi will colonize charcoal and help to monitor the surrounding soil health, moving nutrients around as needed by plants. It was previously thought that mycorrhizae would only colonize the roots of plants, but it has been found that they will also inhabit charcoal. This will help them live

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throughout a winter when little root life or activity is present. The charcoal is sourced in 40 pound bags from buying club warehouses and can be obtained in larger quantities directly from the manufacturer.

TRACE MINERALS

Trace minerals are added using Azomite or Elemite to increase the available mineral and trace elements that are often low in today's feed. This helps the decomposition of the pile, is absorbed in the charcoal and carries over to help feed the garden soil.

Once the compost pile is at the top of the bin, we cover it with a generous layer of straw and build a new bin. Then we pretty much ignore the active pile except for watering when it needs it. Every couple of months we check the pile to see how it is progressing, and how much it has started to drop in height. Once the pile is finished it will have dropped about one-quarter to one-third of its original height.

This system has evolved over several years to the present one and has

continually produced better and better compost. This approach may sound like a lot of work, but with the system set up there is very little additional work after cleaning the horse pens. We usually get a full wheelbarrow of fresh manure every other day, and we rotate the addition of minerals, charcoal and wood chips on top of the wheelbarrow load which is then dumped onto the pile, putting the additions underneath the load. Once we have about 2 feet above the last straw layer, we add a few inches of straw. The scent of the active pile is that of a handful of rich fertile earth, so we gauge when to water when we can't "smell the earth" as we walk by. The additional time needed to add to the nutrients range from the time it takes to add a couple of shovelfuls of wood chips or a scoop of Elemite to the wheelbarrow, to a couple of minutes to crush a few handfuls of charcoal.

No matter what your scale, from backyard home gardener to small acreage, these concepts can be scaled up or down to suit your particular needs and animals. Look to your neighborhood or

community for feedstock and supplies for the compost pile. Most horse owners will be happy to give away their excess manure, as most do not compost it, and it becomes a waste management issue. Some farms will have excess straw or broken bales that are not useful for them but would be excellent feed for your compost pile.

Good composting — like much of good agriculture — takes a certain amount of patience and observation, letting Mother Nature work her miracles on her schedule. Think about how nature decomposes and composts leaf litter in the forest or grasses in the pasture, they aren't "done" in 30 to 60 days! Once the cycle is established, you will always have some great compost becoming available for the next feeding of your garden soil.

Stephen Scott is an heirloom seedsmen, educator, speaker, soil building advocate, locavore, amateur chef, artist and co-owner of Terroir Seeds with his wife Cindy. They believe in a world of healthy soil, seed, food and people. They welcome dialogue and can be reached at seeds@underwoodgardens.com or 888-878-5247.