

GROWING SOIL: Secrets to Healthy Plants

What is soil? Healthy soil looks chocolate brown and feels crumbly, loamy, rich and tilthy. While it seems light, it's densely charged magnetically, minerally, and elementally. Two grams of backyard soil contain millions of bacteria and fungi, thousands of protozoa and nematodes, hundreds of ciliates, flagellates, amoebas, algae, and even some micro arthropods and earthworms. Soil is alive with organic matter and microorganisms who burrow, feed, multiply, excrete, and decay—releasing essential plant soluble minerals, nutrients, and fluids in the process. The feeding, mating and predation cycles of all these microorganisms in a balanced soil creates a perfect habitat for healthy plants to thrive. By feeding the soil rather than the plants we build a long lasting ecology that is both durable and resilient.

There are seven main groups of organisms at work in our soils at a given time: Bacteria, Fungi, Actinos, Protozoa, Nematodes, Arthropods, and Earthworms. Together, all of these critters create a circle of life, a feeding chain that we are a part of. They form the soil food web that relies on diversity for resiliency. Creating the conditions for beneficial organisms to thrive allows them to make a nutrient rich medium that strengthens plant growth and immunity for our gardens and orchards. The soil making methods we will describe are really copies of the processes that nature carries out. Making compost and soil, is an acceleration of the natural dynamic forces that create abundant, self-fertile meadows, prairies, and forests.

It is really helpful as you get started on a piece of land to submit soil samples to a laboratory in order to better understand the structure of your soil or that of a client if you are consulting. Sampling is done to determine the mineral and the biological content of soil or compost and the results come with recommendations for how to improve the quality of your soil.

COMPOST METHODS:

Backyard Compost Piles: For those who don't mind weed seeds, and have little or no time, then piling up a sandwiched layers of equal amounts of green yard waste/kitchen scraps and brown leaves/cardboard/straw/ in a corner of the yard and letting it decompose for a few months is one option. Be sure to water it to sponge-like consistency and cover with straw and a tarp. Pile it on top of small branches and leaves to allow good air flow, keeping it aerated. This will produce compost, not the highest quality, but better than sending these resources to the landfill. **NOTE:** if it smells good it is good, if not, it's not.

Heated Layered Pile: Piles that are mixed and watered properly and that have a minimum measurement of one cubic yard will heat up to 130-160 degrees at which temperature most or all of the weed seeds in the pile will be sterilized. The heat generated in the pile comes from the friction of the microbes at work decomposing and feeding on the elements in the pile. The critical elements of effective compost piles are the correct ratio of carbon to nitrogen, optimum moisture and proper size.

C:N Ratio The goal is to establish a carbon to nitrogen ratio of about 30:1. A good rule of thumb is: green materials (grass clippings, fresh plant trimmings, kitchen waste, and manure) are all high in nitrogen. Brown items (dried leaves hay, straw and wood shavings) are all high in carbon. Add roughly half brown and half green for proper C:N ratio.

Moisture The moisture level of the pile wants to be like a sponge that you have just wrung out. Be sure to water thoroughly as you make it, it is very important that the whole pile is moist to create optimum conditions for the microbes to thrive.

Size At least 3' on each side and 3' deep to insure proper temperature to kill off unwanted seeds. Mix all ingredients really well either as you build the pile or after it is all layered up if you have a tractor or a whole lot of people.

Ingredients There are many different amendments we could add to the pile as we build it among these are, small quantities of finished compost as inoculant, or various minerals, liquid humate or fish or seaweed to help feed the biology that is digesting your pile.

Turning the Pile: Turning the pile can be done after the pile heats up the first time and begins to cool. This will help all the material in the pile to break down more uniformly. Piles that are turned less have more nitrogen, piles that are turned more have more humus.

Composting in Place: The sheet mulch method of composting eliminates the need to build compost piles outside the garden and achieves the creation of compost in the place where the bed will be. There is a diagram in your packet that describes one method to create sheet mulch piles that are very effective structures to build rich soil.

Composting with worms/vermiculture: Earthworms are amazing decomposers, they consume rotted kitchen waste, manure, cardboard and many other substances, they consume at least half their body weight every day, they produce a fine soil as these foods pass through their guts. The compost produced by worms is very high in beneficial microbes that live in the worms' stomach. They are microbes that promote plant growth. There are many different commercially available devices for helping raise worms. The most important thing to consider is the harvesting of the material.

Containment: There are many different methods for containing compost. For gardeners, there are commercially produced containers that range from \$50-\$150. If not turned frequently, these units may not aerate properly and so anaerobic conditions arise, where non-beneficial organisms may multiply.

We can also use four pallets screwed together and lined with chicken wire, or four bales of hay lined up side to side to form a square, then fill in the center with the layers. We recommend filling these containers, building a second container, and turning the original pile into the second container once a month or so to aerate and accelerate aerobic digestion and decomposition. We turn the pile for texture and to make sure anaerobic conditions do not arise within the pile.

Larger scale operations use a windrow method to make it easy to access with a tractor or compost turning device.

Aerobic Compost Tea: Compost tea is a living brew of highly aerobic microorganisms that when used as a foliar spray can help to prevent or treat fungal infections and when used as a soil soak can help balance the biology of the soil. It is created by suspending a "tea bag", with finished compost in a tank of water, adding nutrients, and then aerating the water thoroughly for 24 hours or

more. The resulting liquid is a highly concentrated soil food that can be applied at the rate of 5 gallons per acre as a foliar spray or 5 gallons per ¼ acre as a soil soak.

For successful compost tea brewing having properly prepared compost is the key, worm castings work very well as does finished compost, if you have any doubts about the quality of the compost you are using it is very wise to submit samples to a lab for biological testing.

Most soils are deficient in the fungal element. Soaking compost with humic-acid and fish emulsion, increases the fungi in a compost tea brew product and can be applied to leaves, soil, and compost piles to enhance diverse beneficial microbes in the soil biology.

RESOURCES

www.attra.ncat.org publications on production practices, alternative crop and livestock enterprises, innovative marketing, and highlights of local, regional, USDA and other federal sustainable agriculture activities

www.newfarm.org From the Rodale Institute, a newsletter devoted to the latest news about organic farming and gardening techniques

www.acresusa.com A monthly newspaper that covers a wide variety of subjects concerning organic farming (cultural practices, legislation, grant opportunities, etc)

www.jpibiodynamics.org producers of high quality biodynamic preparations, and education and research in biodynamic agriculture

www.kingseyag.com Building soil fertility with NPKS, working with micronutrients, and liming. Offers less expensive and thorough soil analysis.

www.soilfoodweb.com Information on compost, compost tea and soil biology—including books, a monthly online newsletter.

www.earthfort.com Is the best distributor for compost tea products, brewers and also does biological testing of soils and composts

www.groworganic.com Peaceful Valley Farm Supply offers a broad range of products (tools, amendments, seeds) for the organic farmer/gardener

BOOKS:

Teaming with Microbes—A magnified look at micro-organisms and their symbiotic structure and function in the soil and among plant roots

Gaia's Garden: A Guide to Home-Scale Permaculture—Excellent resource for planning, planting and maintaining backyard style permaculture

Grasp The Nettle—Introduction to Biodynamic principles and plant preparations

Hands on Agronomy—Cation-Anion Connection, Tilling, The Nuances of Calcium, Magnesium and Nitrogen, Phosphorous & Potassium, Sulfur, Using Manures, Micronutrients and their Application, Nutrients and Soil Biology

Bread from Stones—A scientific based classic on minerals and their power to restore our soils and improve yields

The Worm Book—how to build a bin, vermicomposting essentials, earthworm benefits, biology, recipes...