The Art of Making Fine Compost

Up close and personal with the Saprophytic Fungi that is integral to compost quality.

Few things have stood the test of time like the practice of turning organic material into compost to enhance plant fertility. We are continually discovering more about the wonderful properties of good old compost and it remains one of the most valuable resources growers have at their disposal.
So what is this amazing stuff and how do we make it?

Composting is essentially a revved up version of the decomposition that happens to plant and animal residues that end up on the soil surface. Through the actions of microbes, nutrients held in dead organic materials are released and made available for plant uptake once again. What remains, gradually gets broken down into the humus fractions that are all important for soil structure, holding capacity and nutrient exchange. Numerous compounds are produced in the process that stimulate surrounding biology, induce pest and disease resistance and promote plant growth.
In nature, this all happens quite slowly and is very much dependant on availability of materials and prevailing conditions. With composting, we set up systems for efficient decomposition, and the turnover of a quality by-product.

To make compost well, we need to provide the various composting microorganisms with a good balance of the food, air, water they require and suitable living conditions.

Their basic foods include:

- Carbon based materials: straw, grass clippings, crop waste, shredded newspaper etc…
- Nitrogen rich materials: manure, blood and bone, fish emulsion, legumes etc…
- Green plant materials: greens, weeds, grass clippings, woodchips, crop residues, seaweed etc…
- Mineral nutrients: rock dust, clay etc…
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Carbon based materials provide the energy that fuels microbial activity. The lignin, cellulose and chitin in woodier materials are also an important food source for saprophytic fungi.
Nitrogen rich materials are integral for building protein. Bacteria, in particular, require nitrogen in large amounts and although free-living, nitrogen-fixing bacteria can acquire nitrogen from the air, it takes a lot of energy and more time.
A mixture of roughly 60% dry carbon based materials, 10-20% nitrogen rich materials and 20-30% green plant materials by volume is bound to support strong microbial activity.

Fresh plant and animal materials, while not essential, bring a range of active microbes and vitamins, hormones and enzymes that contribute to the overall diversity and health of the biology in the compost heap.
Locally sourced ingredients tend to harbor microbes that are well adapted to that environment, resulting in compost with better microbiology for your situation. Also, using plant material in your compost that is of a similar nature to your crop type, favors microbe groups that readily associate with and support those things you want to grow.

Adding minerals, especially those that contain nutrients found lacking in your soil, sponsors microbe populations that extract and convert those nutrients into organic states that plants can readily utilise.

Hydration is a must if microbes are to remain active, otherwise they go dormant or die. When making compost, dry ingredients should be wetted, and throughout the life of a heap, moisture levels must be monitored and maintained to prevent it from drying out. On the flip side, if it's too wet, air supply is compromised and some nutrients are prone to leaching. Ideally compost materials are kept moist but shouldn't drip when squeezed.

Oxygen is critical for the respiring organisms that drive the rapid decomposition, taking place in a freshly made compost heap. When there is a ready supply of food, water and air on offer, these microbes really get working and burn lots of energy in what is referred to as the thermophilic phase of composting. This is handy because the heat generated can destroy undesirable pathogens and weed seeds. However, without adequate aeration, the inherent oxygen quota is quickly exhausted and aerobic activity is compromised, coupled with the occurrence of less desirable anaerobic microbes.

Compost can be turned during the thermophilic phase to replenish oxygen levels and rotate materials through the hot centre of the heap. This involves checking with a thermometer and systematically turning the pile within defined periods of time at certain temperatures. The Soil Food Web champion a bio-complete compost system of this nature.
https://webinar.soilfoodweb.com/webinar-2-multiplying-the-beneficial-microbes/60203

Alternatively, some composting systems are built in such a way as to allow air to enter from the bottom and circulate through the heap via air channels or pipes. The Johnson-Su bioreactor is a great example of this sort of system.
https://www.csuchico.edu/regenerativeagriculture/bioreactor/bioreactor-instructions.shtml

Material bulk is also necessary for the microbe activity associated with rapid decomposition. Preferably, a compost heap is built in such a way that it holds shape to a width and height of least 1.2m, either with succinct stacking or the use of a bay or cage to contain the materials.

Exposure to extreme weather can be problematic so it’s best to set up your compost in a somewhat sheltered spot out of direct sunlight. Providing a semi permeable (to allow for gas exchange) protective covering reduces evaporative water loss and generally helps to regulate conditions within the heap, making for more uniform decomposition.

As the supply of high-energy foods like fats, proteins and complex carbohydrates diminishes, a compost heap starts to cool down and the saprophytic fungi contingent gets going. Strong fungal colonisation is integral to the development of top quality compost and beyond this point, disturbance should be minimised to avoid damaging their fragile hyphae.

Thereafter, a diversity of composting worms can be added to the heap for all the benefits that they bestow and to further the decomposition process.

Over time the heap shrinks and facultative organisms that are capable of switching to anaerobic respiration and fermentation when oxygen supply is limited, get involved. With their unique metabolism, they breakdown remaining organic materials into ever-smaller humus fractions, that are increasingly resistant to further decomposition. These fractions adhere to clay and silt particles in the organo-mineral complexes that underpin the formation of micro aggregates and lasting soil carbon. As such it’s not a bad idea to incorporate some clay or fine soil when making compost.

Regardless of the chosen method, the art of making fine compost lies in our ability to manage these different stages decomposition so that the various microbe groups can do their thing and reward us with high quality, mature compost, that is simply the best for growing healthy plants.