



COMPOSTING PERSPECTIVES

TECHNOLOGY · TECHNIQUES · HELPFUL TIPS JULY 2008

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Exploring Humus In Greater Detail!

Midwest Bio-Systems provides composting systems called Advanced Composting Systems (ACS) that produce *humus compost*. This is one of our distinctions, but what does it mean exactly? It means that the end product from our composting systems is humus, not simply compost. Humus is the dark soil that naturally occurs in forests after hundreds of years of breaking down organic matter. One of its distinctions from other forms of compost is that it is relatively stable and will remain so for many months. This in effect will stabilize and mature the compost.



The process of producing humus is called *humification*. It occurs as the available carbon and nitrogen ions, the unattached, smallest particles of those elements, are digested, processed and stabilized through the work of humus-forming microflora-like bacteria and fungi and microfauna such as protozoa and nematodes. Maintaining an aerobic environment while decomposing (breaking

down) the organic matter allows for the greatest amount of broken down material to be converted or built up into humus. *In other words, producing humus while composting results in the least amount of loss.*

A great number of chemical and biological processes are occurring as organic matter, or matter that once was a part of or derived from a part of a living substance, breaks down into the smallest ions and consequently builds up into humus. The heat that rises from a

(Continued on next page)

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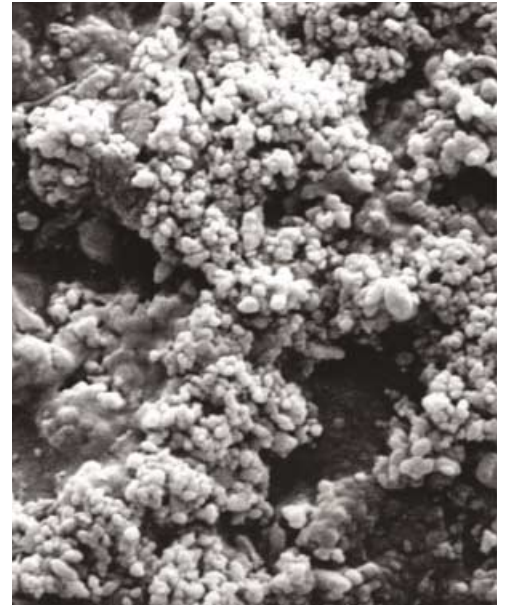
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Exploring Humus (Continued from Page 1)

healthy compost row is evidence of these chemical reactions occurring. If the chemical oxidation and breakdown of compost (which produces a heat reaction) reaches a high enough level of heat that it kills harmful pathogens and weed seeds, it will also break down the organic matter into the smallest ions and is completely safe to build into humus. The micro-organisms in aerobic compost feed upon the organic matter, and as they do so they develop cell protoplasm from the nitrogen, phosphorus, carbon, and other nutrients. The carbon in a compost pile serves as a source of energy for the organisms and is consumed and broken apart, and approximately 70 percent is respired as carbon dioxide (CO₂). CO₂ is a food source for humus-forming microbes and therefore provides a function of building humus. Since the carbon is a source of energy and an element in the cell protoplasm, more carbon than nitrogen is necessary. However, if too much carbon relative to nitrogen is present, the chemical processes slow down. For example, nitrogen reacts with the carbon material and chemically and physically causes cells of organic matter to break down, thus causing decomposition.

As organisms die they serve as a food source for other organisms. These are then consumed by other beneficial organisms which then die and are consumed by others. This process creates a long cycle of life that provides nutrients that are then stored in humus, increasing the quality of the humus. As the organic matter breaks down under a properly and carefully managed control process, e.g., the Advanced Composting System, it is incorporated into humus, the chemical processes slow down, and the compost pile becomes stable. *Compost becomes humus.* Stable humified compost does not have a strong odor; it smells like fresh earth because it has reached chemical equilibrium and stability.



Humus, the final product of the process, is important for soil structure and health. It enhances the biological, physical, and chemical properties of the soil. It helps the soil retain moisture and encourages good soil structure, keeping the soil porous. Humus holds up to nine hundred times more water than does sand, giving it an important role in reducing water use.

Biologically, the nutrients in humus are broken down by and attract thousands of varieties of micro- and macro-organisms. This makes humus more than merely a plant "food." It is a gourmet meal and provides a tremendous benefit to the soil. Humus is the product of a living system of microbes that take the carbon and nitrogen materials of dead plants and microbes and make them available to living microbes and plants — the dead feeding the living. One might say that the carbon and nitrogen from decaying matter is the raw material, the soil flora and fauna are the "chefs," and humus is the "meal" that is served to plants.

When compost contains a lot of humus, it differs in appearance from other decomposed organic matter or compost, in that it has a consistent structure similar to a sugar-like granular structure with very little noticeable plant remains such as twigs or bits of straw. It is dark in color due to the long polymerized carbon chains produced in the process of breaking down the organic matter into humus. Soil or compost containing a lot of humus should be able to be formed into a ball when wet and then completely break apart when dropped from three feet from the ground.

Chemically, humus has many active sites which allow it to bind to the ions of plant nutrients, making them more readily available for the plants to use. It is no wonder that humus is often called the "life force of the soil."

Humus is naturally developed in forests as leaf matter decomposes on the surface area of the soil. The process of developing stable humus can take hundreds of years, but by using the power of aeration and a carefully designed mixture of micro and macro flora and fauna, Midwest Bio-Systems' Advanced Composting System speeds up the process, allowing humus to be developed in weeks — not years, much less hundreds of years — restoring life to the soil.

Long-Chain Polymerized Humic Compounds

One essential difference between humus and compost is the length of its *polymer chain*. A polymer is a chain of molecules that repeats structurally. How polymers work in humus and compost is not entirely understood, but there are some key differences and effects. Humus and compost polymers are primarily made of carbon-containing molecules called *amino acids*. In compost these polymers are short, and in humus the polymer chains are long. These long chain polymers exist only in stable humus. When conditions are right, microbes attach these long-chain humic compounds to bits of clay, resulting in clay-humus crumbs. These clay-humus crumbs provide porosity to the soil, allowing for increased water retention and respiration by aerobic

microbes. The clay-humus crumbs also provide ample area for microbes to live, increasing the soil ecosystem's diversity and capacity. The result is more microbes that work to build soil nutrients, facilitate photosynthesis, and encourage root growth.

Stay tuned for continued series of humus and the resulting benefits.



Featured Dealer: *Bevins Motor Company*

In business since 1946, Bevins Motor Company is a family owned business committed to excellence in service, reliability, and value. With two locations and a staff of thirty, Bevins Motor Company has offered Midwest Bio-Systems' Aeromaster Compost Turners, parts, and accessories to their customers in the Kentucky area since 2005. For more information, contact Andrew Cecil at 1-888-4-BEVINS or visit Bevins Motor Company at the following locations:

Bevins Motor Company
1175 Lexington Road
Georgetown, KY 40324

Bevins Motor Company
908 Commercial Drive
Richmond, KY 40475



Amazing Humus...

An Editorial by Ernest Blosser

It is a summer morning after a nice rain. The air is cool and crisp. The rain has refreshed the earth and the air. Such is the effect of humus on the soil.

We are enthused about the theme of this issue — *humus*, wonderful stuff for soil and plants! Interestingly, in about 1924, there was a three-day symposium in New York. Scientists from all over the world (possibly 70 in number) met to define humus. They came up with almost as many definitions as there were scientists present. These multi-faceted viewpoints reflect the complexity of humus.



So what is humus? It is long-chain carbons that are bonded together that come from certain microbial species. Long-chain carbons could be described as the smallest units of carbon bonded together with a substance into a long chain. Imagine one link being held to the next link with the substances excreted by the microbes' bodies. The long-chain carbons equate to more pore space or soil structure. This pore-space can hold oxygen and water. The longer the chains of the carbons, the stronger the chain and the greater its ability to impact the soil.

The USDA published an interesting study conducted by soil scientist Sara F. Wright that describes this bonding substance as Glomalin. They have found that this highly beneficial substance is of great value in aiding soil tilth. The Ames Soil Tilth Lab has published supporting data as well.

Long-chain carbons will affect all three areas of the soil: **nutrients, soil structure, and microbes.**

Nutrients held by the long-chain carbons are readily accessed by plant roots. They can easily move into the plant upon demand. Being held by the long-chain carbons, these nutrients, unlike conventional fertilizers, are not attracted to bond with other nutrients.

Soil structure is the condition of soil particles in relative position to other soil particles, such as how tight or loose the soil particles are held together or apart from each other.

Microbial life, as it pertains to beneficial life for the plant roots as well as the life in the soil, allows beneficial processes to occur. Microbial life in general is the most beneficial for plants when it is very responsive to the exudates of plant roots by being diverse and able to expand or multiply quickly so it can perform to the needs of plants. This aspect of allowing the plant to dictate what it wants on a when-needed basis is an awesome process of God's creation that amazes us.

Post-Harvest Tea Application

Nourishing the soil rather than the air

Most of you know compost tea has outstanding effects on fertility throughout the growth cycle of the plant. But some customers are finding that it has significant benefits when applied post-harvest, under certain conditions.

How?

After harvesting most crops, some of the plant remains above ground. This residual can be treated in various ways, but most growers leave the organic matter exposed to the air and thus allow release of nutrients during both respiration (which the plant continues for a while immediately post-harvest) and decomposition. **Applying tea immediately following harvest to such a crop can help to “lock in” the nutrients and restore them to the soil the plant is standing in, rather than losing the nutrients to the atmosphere.** The microbes in the tea choke off the evaporation of nutrients, use the plant’s dying and dead organic matter as a food source, and produce beneficial compounds as the result. **The net effect is to improve the health of the soil at a low cost.**

One farmer reports that in his tests, running the tea applicator immediately behind the harvester results in an increased yield of several bushels in the year following (all other things being equal). If you would like to know more about this and other benefits of extracted compost tea, just call us.

NOTHING CAN REPLACE BEING AT A MIDWEST BIO-SYSTEMS ACS WORKSHOP..

But if you just can't be there, why not give our new instructional CDs a try?



How do we create and restore natural balance to the soil? How do we do it while working with nature rather than against it? Midwest Bio-Systems answers these and many other of your questions in

Living Soil, the new instructional 3 CD set from MBS.

Recorded in Australia, *Living Soil* guides the listener through the science, philosophy, and business of composting. And at only \$149.95 per set, you get the workshop-quality information at a fraction of the price!

If you just can't get to a workshop (or even if you've been and would like a refresher) this could be just the thing for you. **Contact us today to order!**

Producing Compost So It Becomes Humus Compost

Principles of managing particles

Building humus is adding value to waste materials, or broken down and decomposed or composted materials. These broken down materials are often referred to as compost or humus. *Breaking down organic matter (decomposition) does not produce humus. Merely producing compost does not produce humus.*

The question is how do we build humus?

This process of building humus starts with humus microbes consuming and processing broken-down materials and ends up with a product that is of great value to soil and plants. Of key importance to follow correctly are the following four different principles:



1. The ingredients of the recipe should be selected to collectively address the C:N ratio, porosity, and the potential for homogenization, as well as other factors.

2. Aeration of the materials must be directed toward making oxygen present for each particle.

3. A consistent, adequate amount of moisture is needed for each particle.

4. Humification encompasses the entire process of accumulating humus and requires that the proper microbes are present.

All of the above four principles can be managed. However, the only way to execute those principles correctly is if we understand and manage them with an individual particle point of view. *This is*

what we call a particle management process. Whether it is mixing the individual ingredients, exchanging gas, moistening evenly, or building humus, it is imperative that each particle is managed properly.

This process requires more detail than just breaking things down; it requires building up humus polymers with the broken-down, decomposed materials. This extra effort can return huge dividends.

These items are explained in much greater detail at the ACS Workshop.



What our workshop attendees have been saying:

"I have attended five other composting workshops and seminars. The Midwest Bio-Systems seminar has given me the most answers to my technical questions. The folks at MBS use a systematic approach to composting that I found both essential to making high quality compost and making it on a consistent basis."

"I was very impressed. My trip paid for itself in the first half-day."

"This is a system that works! I came away knowing how to do it!"

Upcoming Workshops

Sept. 16-18
Tampico, IL



Nov. 11-13
Georgetown, KY

ACS Compost Workshops provide training in the best methods for converting agricultural waste and organic matter into highly effective organic fertilizer.

ACS Compost Workshops are located near compost production facilities that practice the Advanced Composting System principles. During visits to the compost site, we will demonstrate what was taught in the classroom in a **real work environment**. Our updated curriculum expands the **hands-on** time at the compost site to increase the confidence level of participants so that they can go home and produce highly effective organic compost. Compost **site demonstrations** include windrow building, compost turning, watering and microbial inoculation techniques, and the use of compost process monitoring instruments. The sessions also include production **troubleshooting** as well as the tips on increasing compost quality **without increasing the cost**.

It is the combination of classroom instruction and compost site work that make the ACS Compost Workshops an effective way for you to get started or improve your existing operations.

Seating is limited — Register today!

**Contact us today for
pricing information:**

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- **Act N** — Introduces strong nitrogen fixing bacteria that work to make the soil's natural nitrogen available to plants so that synthetic nitrogen does not need to be added.
- **Act Phos** — Releases nitrogen fixing, phosphorus solubilizing bacteria that break down the soil's phosphorus for plants to use.
- **Act Foliar** — Releases yet another kind of robust nitrogen fixing bacteria to stimulate photosynthesis, when sprayed directly on plants' leaves.
- **ActPak** — ActPak Compost Tea Activator catalyzes a diverse mixture of microbes and sustains them while the tea is being applied to plants and to the soil.



Inquire today!

The Winner *of the MBS Slogan Contest is:* **Alex Buck from Kentucky**

Here's the slogan:

***"The facts are in —
composting wins!"***

Congratulations, Alex!

Composting Perspectives

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