MIDWEST BIO-SYSTEMS' NEWSLETTER
April 2004
Subject: Composting for Humification

The Preliminary Steps:

- Recipe formulation—it is common knowledge in the composting world that ideal carbon to nitrogen ratios should be in the 30:1 range. Less understood is that composters should:
- Look for feedstock options that complement each other for breakdown efficiency; materials need to go through the phases of the compost process together. We refer to this as synchronization. Slow reacting nitrogen sources e.g. duck manure, horse or cow manure (with shavings), or bagasse should ideally be matched with other slow reacting carbon sources such as wood chips, sawdust, hardwood bark, or corn cobs. Fast reacting nitrogen sources such as green manure, chicken or turkey manure, or vegetable wastes should ideally be matched with fast reacting carbon sources such as apple sludge, grape pumice, moist leaves, or hay.
- Slower decomposing feedstocks can be prepared for composting by pre-treating them.
- The greater the number of feedstocks included in a row, the greater the microbial diversity.
- Density factor—feedstocks are matched by volume, not weight, and it is important that they entire windrow not be overly dense as CO_2 and O_2 exchange (an essential to optimize the microbial environment) is thereby limited.
- Moisture levels should be in the 50% - 60% range.

A Key Component:

- Clay is an extremely beneficial component to the compost windrow. An addition of 5% -10% clay will facilitate odor control, moisture management, reduce shrinkage, capture more nutrients, provide a foundation for crumb structure, and provide a pH buffer.
- Whether or not a clay source is good for composting can be determined by low levels of sand and aluminum in the clay.
- The clay can be activated and broken up in preparation for composting by planting rye grass in the clay. The rye is fast growing and produces long roots reaching down into the clay.

Thermophilic Decomposition:

- When feedstock materials are combined, gravity insures contact between particles.
- Added water starts the breakdown process. The soaked cells open and begin to leak.
- The leaking fluids react chemically, generating heat.
- The heat, in turn, expedites the breakdown of large pieces into smaller ones and complex organic matter into simpler substances.

Synchronization:

- Pre-treating slower reacting materials enables slower reacting materials enables all materials to breakdown in the windrow at approximately the same time.
- Having the right microbes available at the right time is what makes high value compost.
- MBS' inoculants are formulated to optimize the composting process during each of the three key phases—breakdown, build-up, and stabilization.

The Three Phases:

- Proper breakdown occurs when organic matter is broken down by microbial processes. The various nitrogen forms are converted quickly to nitrates (NO_3). MBS' ***N-Converter*** provides the specific microbes best suited for this conversion (while also increasing and diversifying the overall microbial population). Nitrogen conversion is the factor carrying the greatest weight in compost quality.
- Humus build-up occurs when the simple compounds from breakdown are re-synthesized into short molecular chain humic substances. MBS' ***Humifier*** provides the microbial species for this build-up.
- Stabilization occurs when the short molecular chains extend to become long chain varieties. Volatile substances are stabilized and the microbial population expands. MBS' ***Finisher*** facilitates this.

Microbial Decomposition and Humification:

- For humification to transpire, four generations of microbes must come in succession—each one enabled by the previous generation's work.
- While the fluids from the leaking cells react to produce heat, microbes (either present in the feedstock or added through inoculation) feed on these fluids as well. Cell walls both adsorb and emit substrates.

Humus Chemistry in the Soil:

- Applied with humic acid (either in the form of humified compost or humified bio-blends), minerals combine with the humic acid content, forming compounds that plant's root system can absorb.
- The humic acid buffers the formed humic mineral salts, metering nutrient availability to better match the timing of plant mineral demand.
- Applied without humates or humified compost, mineral nutrients react with each other, forming compounds the plant cannot access (total nutrient versus available nutrient principle).
- Humified compost can play a vital role in bringing the primary elements of soil fertility (physical-biological-chemical) into balance as well as maintaining that balance over time.
- Humified compost serves as a supplier of beneficial microlife, a microbial food source, and an influence on the growth of beneficial microbes (bringing each functional group into proper balance). Inoculants can be used to supplement deficient species.
- The optimal benefits of soil humus do not develop until soil humus levels reach saturation.

The Microbial Environment:

- The microbial profile in the soil is influenced by the microbial environment.
- We can manipulate this environment so it favors the species beneficial to plant growth, yield, and quality—yet unfavorable for plant pathogens and other limiting factors.
- High quality compost, in concert with other healthy soil management practices, builds a microbial environment in which microbes thrive and multiply.
- In a healthy environment, beneficial microbes can double and multiply many times over to achieve an optimal growing environment. Compost value has much to do with its microbial profile, but even more to do with its ability to build a thriving microbial environment.

The Role of Humified Compost in the Soil:

- It expands clay colloids—improving soil structure.
- Water management—it holds 4 times its weight in water (serving as a reservoir) while allowing excess water to pass through due to improved soil aggregation.
- It allows air to enter the root zone—supporting beneficial aerobic microbes. Without air, the beneficial aerobic microbes die and are replaced by anaerobic microbes (often causing disease).