

# Soil Regeneration Super-Compost at Missouri Organic

7700 E. US 40 Highway, KC, MO 64129  
Winter 2017

Since June 2016, a few of us have worked together to make a better commercial compost. Our team collaborated with the goal to produce a "premium compost" able to deliver consistent, reliable results for effective use in commercial food production, horticulture and landscaping.

Kevin Anderson, Vice President of Missouri Organic, was enthusiastic, did his own research, contributed his own ideas and materials. Despite setbacks, Kevin persisted to advance this effort a huge leap forward. In a recent email, Kevin set the bar high for our first test batch by naming it "super-compost." I'm confident we can deliver that quality – but maybe not fully on the first try.

Monday January 30, we built the first experimental



carbon that increases water-holding capacity and improves fertilizer efficiency. This boosts Cation Exchange Capacity (CEC), and adds Anion Exchange Capacity (AEC) to also capture nitrogen and phosphorus. Finally, the biomass is inoculated by a broader diversity of microbes beyond the usual digesting bacteria.

The ultimate result of these improvements is compost with measurably higher fertility, higher performance, higher yield, and higher quality crops.

Our first experiment began as a 300-foot long, 900-cubic-yard windrow of ground yard waste, with restaurant and retail food waste. Assorted minerals were blended into biochar, then moistened with wood vinegar and sea minerals. This was spread on top of the windrow. After two passes with a compost turner, minerals and biochar were nicely, finely mixed into a soft, porous pile of biomass.

Our windrow is inoculated with HarvesQuest™ – Kevin's choice of a commercial culture of compost microbes – a full array of digestive bacteria, with more complex services of fungi and other microbes. After inoculation, the entire windrow was covered with yard waste mulch.

I observed the windrow assembly, took photos, offered advice. The windrow began as a double row of ground-up woody yard waste. Restaurant and retail food waste was dumped in a groove between the double-row. This biomatter was thoroughly mixed with a compost turner. The windrow already began to heat up as microbe digestion began. In chill early morning, warm moist outbreath of the microbes was a thin mist that blew beautiful in the light wind.

EXTRA INGREDIENTS ADDED to beginning biomass were biocarbon, minerals and microbes.



Fig. 1: The beginning was a 300-foot windrow of ground up yard waste blended with restaurant and retail food wastes.

windrow at Missouri Organic in Kansas City – a 300-foot long, 6-foot high, 900 cubic yard blend of ground yard waste, plus restaurant and retail food waste. To this we added our own recipe of biocarbon, minerals and microbes, carefully blended together, then blended into this starting windrow.

Missouri Organic, TerraChar, Green Frontier Soil, and other friends are excited to announce this special first-ever product will be ready for spring planting season:

**Super-Compost**  
made with extra ingredients  
**biochar, humic acid, sea minerals,  
rockdust, clay and microbes**

Just for these additives, our first effort will come close to, if not meet, Kevin's ambitious super-standard for quality.

This new compost will be pH balanced and buffered for minimal disturbance to soils. Adding alkali minerals, including rockdust trace elements, assures a full menu of nutrients. Complete microbial digestion converts rockdust minerals and biomass into abundant, available plant food. This improved compost has higher humus – super-stable

- improved new **Super-Compost** will:
- Higher humus level – the black stuff
  - Boost & balance major minerals
  - Assure complete trace elements
  - Increase soil C.E.C. – & add A.E.C.
  - Increase water-holding capacity
  - Retain full spectrum nutrients
  - Deliver broad microbe biodiversity
  - Improve fertilizer efficiency & performance



Fig. 3: Kevin Anderson discusses the day's work while Kathy Adams takes photos. White totes contain extra ingredients.

**Biochar**, the main bulk ingredient, is a special charcoal (charred biomass) designed to put in soil. Our unscreened charred oak was made in a kiln, with thumb-size chunks down to dust. This raw oak biochar was bone-dry; moving it stirred up thick black fog that drifted across the compost yard, coating everything with carbon dust .

Biochar isn't reactive, thus isn't degraded by chemicals, weathering or microbes. Thus, biochar is **super-stable**. It's lifecycle in soil is centuries, not months. Biochar supplies seeds of stability for complex biocarbon molecules to gather into larger aggregates. This supports an increase in stable humus formation in the compost.

Biochar has remarkable capacity to adsorb and store water, ions and minerals. Biochar's microscopic pores provide housing to shelter microbes are blended into biochar. The marriage of carbon and minerals is highly efficient delivery system to hold and carry nutrients and organisms into soil successfully, widely, rapidly.

Our goal is a close, intimate physical mixing, with water held inside, fine powders coating larger bits of biochar, and multitudes of microbes quickly colonizing every grain.

supplied by TerraChar of Columbia MO: [www.terra-char.com](http://www.terra-char.com)

Fig. 2: Azomite unloads into bucket loader, to then spread on biochar. The very fine powder blended intimately with biochar and reduced dust.



**Rockdust:** By weight, most extra ingredients are natural minerals, most as fine powders. Soil begins as rock, and is decayed, rotted rock. Microbes dissolve minerals from rock to turn into soil, a special living matrix. Mineral elements from geology impart positive and negative charges to power cells and structure biology.

Rock powders accelerate new soil formation by seeding proper elements to optimize primary microbe metabolism. Alkali elements react with volatiles to reduce outgases, curb odors, raise pH, retain nutrients, deliver extra charge to enzymes and microbes. Microbes rapidly consume and capture rockdust minerals, balance pH and boost fertility in the final compost.

Atoms give up valence electrons to become "free" electrons and charge char and soil, power reactions, and prepare char to absorb water and function in compost and soil. Char holds minerals in available, stable states, rather than lost by leaching or outgassing. This improves nutrient capture and delivery efficiency, reduces need for fertilizers.

To choose rock to turn into dust, and then into soil, three key principles apply:



First: Emphasize *igneous* bedrock from magma and lava, over *sedimentary* bedrock made from water. Igneous rock formed from fire is usually denser, more crystalline than sediments deposited from water.

Second: Emphasize a diversity of elements, especially *Trace Elements*, versus single element sources. First priority is to establish a broad mineral foundation. After a complete menu of minerals is assured, then adjust individual elements, especially the **seven Major Minerals**.

Third: Fresh-fractured rock yields best results. New elements, not exposed to air, not reacted with water, oxygen or CO2, with sharp edges and points These new minerals recharge soil ions and electrons to support strong growth.

We use these types of bedrock geology for agriculture: basalt, carbonatite, rhyolite, lamproite, granite, limestone, gypsum, rock phosphate, humates. **Rock Dust Local** in Bridport, Vermont was a leader in agrominerals for 30 years, and is our primary source of materials and expertise:

[www.rockdustlocal.com](http://www.rockdustlocal.com)

Below is what went in our first windrow:

**Rhyolite:** fine-grained, silica-based magma bedrock

from surface lava, with abundant heavier, denser elements, especially trace and rare earth elements. This density, plus multiple valence electrons, help form stable humus.

Our magma dust is from a Missouri quarry mining lava from an ancient volcano. Dense, crystalline rock is crushed and screened into gravel and sand. Byproduct of crusher screening is fine, freshly fractured dust, rich in trace, transition and rare earth elements.

supplied by David Yarrow, TERRA: [www.terra-char.com/rhyolite](http://www.terra-char.com/rhyolite)

**Clay:** two bucket loads of loess clay dug on-site was added to biochar. Clay is a key component of functional, fertile soil, yet missing in biomass-only compost. Clay is very tiny plates with negative electric charge that attract cations and aggregate carbon molecules. Thus, clay increases Cation Exchange Capacity (CEC) and formation of stable humus complexes – the most persistent, darker fraction of compost. Small amounts greatly improve the stability, value and nutrient-density of the final compost, and enhances its fertilizer effectiveness in soil.

**Azomite™**, special clay from central Utah, is a seafloor sediment of ancient Lake Bonneville, an inland sea



surrounded by lava flows and magma bedrock. This unique clay deposit has 76 elements, hence:

**A-to-Z-Of-Minerals-Including-Trace-Elements**

Azomite™ is a quality source of trace elements with 70 years successful use in agriculture and horticulture as soil amendment and feed supplement. As clay, it binds and holds cations to increase CEC and humus creation. Trace elements with multiple valence electrons bond to several other atoms. Small amounts of these elements have huge effects on humus formation and stability.

supplied by Scott Edmunds, LeaWood KS: [www.azomite.com](http://www.azomite.com)

These bone-dry ingredients were blended with a bucket loader skillfully operated by a MO employee. Thick dust is released handling these powders in strong breezes. Our goal is for very fine mineral powders to be attracted to and adsorb onto surfaces of biochar particles in an intimate, tight association. Blended materials are less dusty than separate powders, especially slightly moist loess clay, suggesting the biochar-mineral adsorption strategy was successful.

Our mix was very dry, and microbes need lots of water. So, a tote tank from an on-site leachate pond was enhanced



Fig. 4: Azomite unloads into bucket loader, to then spread on biochar. The very fine powder blended intimately with biochar and reduced dust.

with extra electrolytes: SEA-90 sea minerals (alkali cations) and Wood Vinegar (acid anions), stabilized by Humic Acid. This was puddled on the surface of the mix, then folded like cake batter by a bucket loader. Extra electrolytes boost biological metabolism and activate microbes to more rapidly digest biomass into compost. Ultimately, the added electric charges upgrade the compost fertilizer value.

**Sea Minerals:** Every element that dissolves in water is in the sea, especially trace elements, in immediately soluble, complete, fractal form. A complete mineral menu is the foundation for soil health, nutrient-density and crop quality. Sea minerals are 100% soluble and very mobile, thus an “igniter” to jumpstart microbes, who then digest and release minerals, nutrients and energy in rockdust and biomass.

SEA-90 is a premium product, extracted from tidal pools on the Sea of Cortez in northwest Mexico. This unique geology niche is a rare resource to harvest sea minerals. SEA-90 is high in transition and rare earth elements due to deep water emissions from magma vents on tectonic plate boundary at the bottom of the Sea.

Small amounts sprayed on for widespread dispersal and coverage accelerates microbe activity and proliferation.

supplied by SeaAgri of Dunwoody GA: [www.seaagri.com](http://www.seaagri.com)





Fig. 5: Gray layer of biochar plus extra ingredients is in position, ready for mixing into the composting biomass underneath.

**Wood Vinegar:** byproduct of making biochar by pyrolysis. Biomass sealed in an oven or retort is baked at 700-900 degreesC. Volatile vapors and liquids (VOCs) are distilled out of biomass, leaving charred biocarbon with embedded minerals. Chemicals cooked out are captured and condensed into watery and oily liquids. This dark, smelly fluid is mostly acetic acid ("wood vinegar"); a small fraction is "oil of smoke." Wood vinegar has a long history of use in Asian agriculture as herbicide, insecticide, plant stimulant, and microbe activator. [We used a wood vinegar dilution of 1000:1 as an initial compost activator.](#)

supplied by TerraChar of Columbia MO: [www.terra-char.com](http://www.terra-char.com)

**Humic Acid** is ultra-fine geological carbon extracted from humates, an immature form of coal. Refining yields a powder that disperses in water, or sprays. Humic acid coats surfaces with fine films of carbon, making them microbe friendly. Humic carbon is ideal to enclose charged ions ("chelate") and thus render their string electric charge safe to transport inside cells and plants. This carbon chelation increases nutrient efficiency, so less fertilizer is needed. Thus, pennies of humic carbon saves a dollar of fertilizer.

supplied by TerraChar of Columbia MO: [www.terra-char.com](http://www.terra-char.com)

WORK TO ASSEMBLE THIS FIRST BATCH went very well, and created a very nicely blended windrow. Kevin and

his men worked diligently to intimately mix these materials together. A bucket loader is a large tool to mix a few tons of dry ingredients, but a skillful operator achieved an intimate blend. With very little dust, the biochar-mineral blend was bucketed on top of the waiting windrow.

Pond water was brought by tank truck and splashed on the windrow just ahead of the compost turner. This machine straddles the windrow as a rotating shaft with flanges flails the biomass under a cover. The turner made two passes down the windrow, and thoroughly blended the two layers.

**Harvest Quest™:** Kevin Anderson chose a new commercial culture of compost microbes to upgrade his operation's microbiology. Conventional compost is heavy on bacteria, short on fungi. This new inoculant has a usual array of digestive bacteria, but adds larger, more complex fungi, actinomycetes, and more microbes. Harvest Quest™ has missing parts of a complete soil digestion system, thus fire up rapid, more complete biomass breakdown. Compost finishes in less time, emits few odors, retains more nutrients, and is only turned twice, not weekly.

Harvest Quest™ supertote, divided in two, is deposited



at ends of the 300-foot windrow. In a few days, fungi grow down the length of the windrow, then inwards to digest innards of the windrow.

supplied by Ecoverse of Avon OH: [www.ecoverse.net](http://www.ecoverse.net)

OUR FIRST WINDROW WAS COVERED BY MULCH – a thin skin of yard waste as a thermal blanket to hold heat and moisture. Inside, microbes proliferate exponentially on a rich menu of biomass and minerals. Microbes digest carbohydrate-rich plant matter to release energy, and the windrow heats up quickly. Even after several sub-freezing windy days, the pile was steaming inside. Microbes love this sweet carbon cake, eat it up fast to leave behind a living matrix of minerals, trace elements and stable humus to energize and enliven soils. Indeed, digesting microbes quickly went to work. In three days, temperatures inside the windrow rose to 140 degrees F.

In eight weeks, biomass digestion should be complete and slow, and compost stable, ready to spread. We may need to turn the windrow once or twice. Biomass shrinks 30% from digestion; another 15% is lost to cleaning trash and screening chunks. By mid-April, the 900-cubic-yard



windrow will yield 450 cubic-yards of finished compost.

TEN DAYS LATER, WE INSPECTED THE WINDROW. Weather continued to be windy, overcast and chill. Microbes are temperature sensitive, and persistent cold temperatures seemed to slow initial biomass colonization. We cleared away brown mulch to expose the windrow surface. In dim light, my camera failed to focus on fine details, such as fungi hyphae or wisps of steam.

In a few days, fungi grew 150 feet down the length of the windrow. Fungi were visible as faint grayish-white films coating biomass surfaces. However, spread of fungi was uneven, and some areas showed little signs of fungi, so better inoculation procedure may be needed. Cold, dry air quickly dried up exposed fungi, and whitish color faded after a few minutes as fungi shriveled in the chill. Cold wind also discouraged us from more thoroughly exploring the pile.

I'm confident we had a good (if slow) beginning, and digestion is getting started in the windrow.

SECOND INSPECTION THE NEXT WEEK was also sub-freezing, with brisk wind. I started near the middle of the 300-foot windrow, and dug over two dozen test holes to



90+% water, and a prime purpose of fungi is to pump water through whisker-thin tubes of hyphae. A cup of healthy soil has miles of mycelium, mostly made of water. Water is a primary, critical limit on microbe growth. Water shortage in our windrow was serious enough to weaken microbe activity, retard fungi growth, slow biomass digestion.

Kevin agreed the windrow needs water, and to wet it and turn it again. While it's best to not disturb fungi and their networks, it's urgent to get more water inside to feed their proliferation. If conditions inside are optimum, with abundant water and food, fungi will recover quickly to regrow their networks. Turning can also open and aerate the biomass for faster digestion.

THE NEXT WEEK WAS A THIRD INSPECTION in the worst weather yet: heavy overcast, near-freezing, nearly rain, stiff wind blowing over fresh windows full of fermenting bacteria outgassing acids and other irritating aerosols. I endured distress enough to dig half-dozen test holes.

Surface layers were cool, suggesting minimal microbe activity. But three inches deep, biomass got warm, with lots of deep heat. All biomass surfaces were covered in white fungal fuzz. Inside, the windrow is warm, teeming with life.

Weather made a serious inquiry impossible, but I noted no strong odor from my holes in our windrow – another sign a different compost is taking shape. Instead of outgassing volatile, reactive chemicals, nutrients are fixed and retained,



Fig. 6: Entire windrow covered with a thin layer of mulch to seal in moisture and protect from excess heat from sun and drying wind.

examine the contents. Carefully brushing aside a few inches of brown mulch, I exposed the windrow surface – visibly darker gray, solid, with contrasting white funi fuzz of fungi coating every surface. Already, fungi grew 150 feet through the windrow from opposite ends where inoculant was applied, and now grew inwards to digest plant matter.

I scooped 6-inch-deep holes into the windrow at 10-foot intervals. Faint steam misted from the interior as microbe digestion heats the biomass. Deep inside, the windrow generated ample heat to sustain vigorous microbial activity. However, the outer inches of digesting biomass and mulch were cooler, with fewer signs of active digestion and decay.

Microbe activity varied a lot, suggested an uneven start. In a few areas, biomass was packed too tight, and coated with clay, resulting in poor air infiltration and mostly anaerobic digestion. Parts of the windrow need to be opened to aerate the interior and improve microbial action.

Many areas felt dry; the biomass seemed thirsty, in need of water. A few areas were definitely a dry. Living cells are



thanks to biochar, alkali minerals, clay, and fungi. I extracted a football-size ball of biomass from the bottom to take into shelter of the office to study and photo.

TWO WEEKS LATER, WATER WAS ADDED and the windrow turned. Wednesday, March 1 Kevin and his men attempted to mix a large volume of water into an even larger volume of minimal-moist biomass. The tank truck and hose used to make the windrow didn't deliver enough water. At least three times more is needed. Now, a larger pump fed water to large PVC pipe on a simple boom arm, with three outlets to splatter water on top of the windrow.

Tank trunk filled with pond water had wood vinegar, sea minerals and humic acid added to boost electrolytes and stimulate microbes. The truck crept beside the windrow, just ahead of the ahead of the turner. The larger pipe delivered nice streams of water, but was hard to aim or control, and synchronizing turner with truck proved awkward and messy. Mulch cover tended to shed water, so if truck stopped or slowed, water quickly puddled, then flushed mulch off the windrow onto the ground.

After a pass down and back with water truck and turner,



on test plots in April. Samples will be sent to labs for chemical and biological analysis. We'll do quick tests with potted seedlings, and start outdoor, long-term test plots with different crops to evaluate effects of our new compost.

Distributing our first batch is expected to begin May 1. Kevin Anderson asks a modest \$44.95/cubic yard for our first batch – barely more than production costs. Growers who want to test our first effort at a premium product should contact Joel Adams. We want growers willing to allocate plots to conduct simple side-by-side comparison trials.

In future windrows, we will shave costs, refine the recipe and upgrade the process. The price will rise as demand proves its value to serious growers. Already interest in this idea of super-charged compost is high, and the need is strong among growers for a quality soil amendment. So, initial demand for our new product should be strong.

Kevin will start a second "Super-Compost" windrow as soon as he can assemble a complete list of ingredients.



we agreed our windrow was still thirsty, needed more water to support fungi bloom. So, the tank was pumped full again, and truck and turner made a pass down and back, with smoother coordination, but still clumsy, with poor control.

Hand holes I dug in the windrow felt more moistness, but the biomass seemed thirsty. Still, I was satisfied our windrow had enough water to support microbe proliferation and more rapid digestion.

TWO WEEKS LATER, I INSPECTED the windrow, swept away brown mulch to expose windrow surface, then scooped out 6-inch-deep holes. Half dozen holes revealed thick growth of white mycelium. Inside, every biomass bit was ghostly grey as fungi surrounded and consumed it – the explosion of fungi I expected weeks four ago.

I stuck my hand way in, forced fingers deeper into warm, wet biomass. It felt far softer, less tight and dense than a month ago. Heat from digestive fires in the interior was so intense, I had to pull back my fingers.

In seven more weeks, biomass composting should be complete, and stable humus complexes formed.

OUR FIRST WINDROW WILL BE READY to distribute

to get a yard of **Super-Compost**  
**Joel Adams**  
 Green Frontier Soils  
 816-721-4607  
 joel@oracfarm.com

for more information:  
**Super-Compost**  
 Missouri Organic  
 7700 East US 40 Highway, KC, MO 64129  
 816-483-0908

**Super-Compost**  
**\$44.95**  
 per cubic yard  
**20% grower discount**  
 to collaborate in simple field trial  
 side-by-side comparison plots

