Super Diverse Fungal Dominate Composting

Posted by Karn Piana

Karn Piana
Super Diverse Fungal Dominate Composting
August 26, 2018 10:22AM

Registered: 5 years ago
Posts: 77

David Johnson, a professor of microbiology at the New Mexico State University College of Engineering's Institute for Sustainable Agricultural Research has developed an interesting method of achieving a super fungal dominate compost with a far greater diversity of organisms through the employment of ventilation shafts which mould the compost material into an aerobic toroidal mass which does not require turning and allows for the continuous development of mycelial hyphae.

It seems likely that this design will be generally adopted as a better method of producing microbial dense compost in the coming years. This system is extremely inexpensive, simple and rapid to assemble from common materials, reduces compost times by 66%, water usage by 6 times, and increases of fungal mass by 23 times. Johnson observed a unique super diversity of microorganisms within compost produced in this manner . For example, in Las Cruces New Mexico Johnson observed fungi which was first identified in the arctic as well as the antarctic, he saw pelagic (ocean going bacteria) in his pile, and he was privy to one microbe that hadn't been seen for a 110 years (last by Louis Pasteur). His explanation for this was the axiom, "everything is everywhere" and he hypothesizes that his reactor creates an environment which allows this profusion of biodiversity to assemble and multiply from ubiquitous latency.

I personallY have built one of these in about 20 minutes. I had previously made a more refined variation of the Dr. Ingham composting cage method by methodically wiring an inner layer of canvas drop cloth to a section of 2x3 woven wire fencing which was designed to wrap around the compost pile like a tortilla and allow for ease of transfer. The ends of the fence are stabilized with 1/4" metal rod which I cold forged to form handles and an attachment point for a rope closure. Because my composting cage was smaller than Dr. Johnson's I only needed a single center tube of scrap 4" PVC to achieve a space no greater than 16" to ambient air (He says 12" is more ideal). I didn't use the perforated drain pipe which he used because I didn't have it, I didn't want to cut the PVC in my stash, and it's only in for a day. Because I had a few boards of white fir that would be perfect for a project like this due to being riddled with pitch inclusions, I made my own aerated base with a reinforced hardware cloth bottom for additional aeration.

David Johnson is working in New Mexico and in my opinion arid environments tend to showcase certain contrasts between desiccation and verdance. Using a microbial approach to agriculture he has demonstrated dramatically positive results in the growth of several crops through the application of microbes derived from his composting technique. Take a look at the background of some of the photos and soak in the harsh unforgiving reality of the climatic conditions he is working in. His plants are pushing "genetic potential" in the midst of "tree hell".

LINKS:

PDF of the JOHNSON_SU Bioreactor construction

VIDEO of David Johnson loading his composter and discussing it's operation.

An interesting video of David Johnson's stump speech . He discusses probiotic/ microbial agriculture (he calls this BEAM: Biologically Enhanced Agricultural Management), carbon sequestration, soil microbiology, and other topics.

Karn Piana
Zone 7 Semi-Arid Steppe
Northern New Mexico

Reply Quote

Michael Phillips
Re: Super Diverse Fungal Dominate Composting
September 04, 2018 03:55PM

Moderator
Registered: 11 years ago
Posts: 621

Glad you brought David Johnson's work to more grower's attention, Karn. More than a few organic orchardists regard compost merely as a means of replenishing nutrients when the full virtue lies in facilitating microbial diversity. I shared a partial-static composting approach in *Mycorrhizal Planet*, the excerpt of which can be found here. It's a two-step approach that takes time (9 to 12 months) and achieves aeration primarily by placement of roughage, be it sticks poked into the center of the pile (in lieu of piping) or generous mixing of ramial chips for the fungal stage. Setting up a bioreactor is on my list of a things to try, more so to enhance organism diversity than to hasten the

breakdown time. Biodynamic preps also introduce fungal players seemingly from afar. The Bass Becking principle that ***'everything is everywhere but the environment selects'*** provides plenty of motivation to try different approaches and share the lessons learned.

Lost Nation Orchard
Zone 4b in New Hampshire

Edited 1 time(s). Last edit at 09/06/2018 03:40PM by Michael Phillips.
Reply Quote

Nick Segner
Re: Super Diverse Fungal Dominate Composting
October 09, 2018 03:06AM
Registered: 9 years ago
Posts: 49

Karn,

The adventure continues.

I am also excited about Dr. Johnson's research after reading his interview in Acres, USA this past summer. I have been continually trying to improve my composting methods over the seasons, and decided to also try some Johnson-Su Bioreactors.

As I write this, I've filled several Bioreactors this season and plan to fill approximately 10 of them as soon as pomace season comes to a close. Friends here are also assembling them. I've done them per his instructions but my issue is with the landscape fabric. The next few I make will be using the wire re-mesh, then 1/4" hardware cloth, then wrapped fully in newspaper end rolls. The newspaper is blank (ink free), easy to apply, and free! I think this will be important for the moisture retention and UV protection that the fabric accomplishes.

His methods are relatively labor-intensive. I've been emailing with him about materials and other considerations. Particularly, drying manure to then shred and re-wet is a bit difficult to scale up. Some other farmer friends in the area will be doing more with manure, I've been omitting this in the past few reactors. What were your feedstocks?

This material is used as a microbial inoculant rather than as a source of soluable nutrients. I think this approach makes a lot of sense. As he wrote me "it's 98% management and 2% inoculant".

We started a Soil Microscopy club locally a few years ago and will be evaluating these for microbial quality (hoping to see much more brown wide hyphae than we have in our other composts).

Cheers!

Nick Segner

Wildcat Valley Farm
Zone 8b
Olympic Peninsula Rainshadow
Port Angeles, Washington
Reply Quote

Karn Piana
Re: Super Diverse Fungal Dominate Composting
March 16, 2019 04:59AM
Registered: 5 years ago
Posts: 77

Nick,

It's cool you're using this system and emailing with Dr. Johnson. I would be keen to read any updates or assessments whenever you have them. NMSU has some interesting extension events nearby that he is sometimes a part of and although I haven't been able to attend any of them, I hope to go to one this year. I still haven't bought a microscope yet due to it being lower priority tool than others needed for other more pressing projects. Soon. It's awesome you've incorporated it into your work.

Spring is underway here. I opened our reactor a few days ago after several months of fall and winter, turned the contents, and then replaced them again for finishing. I have it set up in the shade of an old pinon pine and for most of the time I have had it, it's been cold and frozen. Due to the frozen state, the reactor hasn't yet gone through the thermophile stages. There are only about 14 cubic feet of compost in the container. I was half hoping to be greeted with extensive mycellial caking, but I don't know if this is a realistic expectation. There was some white hyphal activity, some fuzzy white IMO, and no odor of putrescine or cadaverine despite there being a dense viscous decomposed state. The smell was subtly sweet and fresh smelling, no ammonia, nothing off.. Although I can't assess the bacteria / fungi ratios, I really love the design of an aeration core in the center of the pile. This is a great idea in my opinion, especially for those living in arid environments in which organic matter tends to dry out and not break down very quickly. Everything has seemed to sustain an aerobic environment, and the torus core makes it easier to keep the pile hydrated.

I think the design could be simplified: I used canvas I attached to woven wire fencing, it seems you have a similar refinement with your newspaper end rolls. I used a single aeration core in a bin similar in size to the ones Elaine Ingham is using; but if I were to scale up, I think it would be worth exploring the use of large diameter cardboard tubes used for concrete forming. A single core which you would

initially tie off with rope while filling rather than numerous smaller 3-4" tubes held in place by a cumbersome jig.

With regard to manure: we don't have livestock and although we could get mountains of it from our neighbors, I am less interested in using it at this juncture. We do however have two dogs which have produced an abundance of poop that I am going to ferment with bokashi and then run through another bioreactor. I don't fully understand the process but it seems that the Johnson Su method removes salinity from the manure compost via fungal molecular decomposition? I think there is a similar effect in Bokashi (via actinomycetes?), Would a fermentation precursor stage allow the time consuming shredding phase you described to be avoided?

I know that the primary bacteria in "EMs" are facultative, but I wonder if one had a huge volume of manure to ferment would it be possible to do so in a partially or non anaerobic environment? Does Bokashi have to be entirely anaerobic to decompose?

Good luck and a happy spring to you.

_K

Karn Piana
Zone 7 Semi-Arid Steppe
Northern New Mexico