Soil/Compost Microbial Richness and Diversity (EP)

FACT SHEET

Background

For years agricultural soil scientists have recognized the overall health of the soil depends largely on the soil microbial community for enhancing the soils richness and fertility status. These microorganisms have a profound influence with respect to both the availability of nutrients as well as on the suppression of harmful soil-borne plant diseases. A&L Canada Laboratories over the last 12 years has worked closely with Agriculture Canada soil specialists to enhance these beneficial microorganisms in production of potatoes and horticultural crops. More recently emphasis around the globe by agricultural, and environmental scientists has been focused on the actual microbial community in soil and soil amendments such as compost, with particular attention on what is commonly referred to as the eco-physiological index (EP) and the diversity of the microorganism species with respect to their relationship with beneficial activities. To quote one researcher “An area that appears to hold the greatest promise for technological advances in crop production, crop protection, and resource conservation is that of promoting beneficial and effective microorganisms in soil an amendments (Dr. Higa, NZ). Research information and recent advances in this eco-physiological indexes has allowed us at A&L to now offer some applications of this technology and promote this research for both soil and compost monitoring.

Monitoring Soil Richness

Agriculturalists and growers have for centuries recognized the importance of testing soil for its chemical parameters. It has only been recently though with the advances in the microbiological field, that the value of soil microbiology technology has gained recognition. This species richness and its diversity of organisms have lead to enhancing the beneficial soil components at the same time inhibiting the harmful soil and disease properties. More important research has shown it is the proportions of these important species, versus the concentration levels of the functional microorganism types that gives the richness and nutrient availability properties to the soil

Why test Compost/ Soil

In order to ensure that quality mature compost and soil meets both the physical and microbial enhancing requirements, analyzing its micro-flora content and its diversity is important for successful use of both compost and soils used for producing today’s demanding crops. Research suggests certain feedstock material and composting systems
produce finished compost with different levels and diversity of microorganisms. Carbon-rich feedstock generally promotes fungal organisms, where as nitrogen-rich materials promotes bacterial concentrations. The eco-physiological index (EP) of these levels allows practical applications of the monitoring to both control and evaluate the composting process. The relationship between the functional organisms in the soil has a direct impact on plant nutrient availability, disease presence and resistance, and lastly the quality of the end product.

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Microbial Soil Species

Important soil microorganisms are grouped according to their specific type and their intended levels in the soil/compost. Growth requirements are particular to whether they require oxygen or not (aerobes vs. anaerobes), fungi, organic carbon or nitrogen preferential organisms. The following are some general guidelines based on the species.

- Aerobic Bacteria levels: Aerobes are a good indicator of soil/compost microorganism richness. The more aerobic bacteria present are preferred.
- Anaerobic Bacteria levels: Generally high levels of anaerobic bacteria indicate lack of oxygen and poor aeration in the compost process or soil conditions. Ideally aerobic bacteria should be a minimum of 10:1 over the anaerobic bacteria counts.
- Yeasts and Molds: These organisms are principally involved in the fertility nutrient cycling. Besides decomposing on organic compounds into plant available forms of nutrients, they aid in creating beneficial soil aggregates as well as help to control certain plant diseases.
- Actinomycetes: Besides improving soil structure, and reducing certain plant diseases, they also are involved in nutrient cycling of organic compounds.
- Psuedomonas: This species and family of bacteria are particularly involved in the mineralization of phosphorus to plant available forms
- Nitrogen Fixing Bacteria: This species is principally involved in converting atmospheric nitrogen to inorganic nitrogen compounds used by plants.

Biodiversity of Soil and Compost Reference

Species		Expected Range CFU/ gm	Eco-Physiological Index (EP)
Aerobic	Soil	10^7-10^9	0.2-2.0
	Compost	10^7-10^9	
Anaerobic	Soil	10:1 (Aerobe:Anaerobe)	
	Compost	10:1 (Aerobe:Anaerobe)	
Yeast/ Mold	Soil	10^5-10^6	0.2-2.0
	Compost	10^3-10^5	
Actinomyctes	Soil	10^5-10^6	0.2-2.0
	Compost	10^6-10^8	
Psuedomonas	Soil	10^3-10^6	0.2-2.0
	Compost	10^3-10^6	
Nitrogen Fixing Soil Bacteria		(Not currently offered)	

A&L and Microbial Diversity

Applying the latest technology and continuing to develop new research applications has helped A&L to provide advances in this exciting area of soil microbial health.