SOIL MICROBES AND SOIL BIOLOGY FACT SHEET

A soil amendment or additive is any material applied to a soil to improve its physical characteristics such as water infiltration and retention, permeability, drainage, aeration, and structure, and/or its microbial activity. The goal from adding any soil amendment is to provide a better or improved environment for plant roots and soil microbes.

There are two broad categories of soil amendments–organic and inorganic. Organic amendments are derived from something that was alive, while inorganic amendments are either mined or are man-made. Organic amendments increase soil organic matter [SOM] that is an important energy source for microbes and other living organisms in the soil.

Soil amendment applications should benefit growers in several ways that include: 1) increased nutrient availability and retention due to increased organic matter; 2) increased water holding capacity and water infiltration into soil; 3) enhanced soil microbial activity; 4) enhanced soil carbon [C] storage; and 5) more sustainable crop production systems.

There are two approaches to improving soil microbial health and/or activity. First, beneficial microbes can be added to the soil to potentially increase soil microbial activity that should provide the subsequent benefits derived from that increased activity. Second, microbes that are already in the soil can be enhanced by increasing the food supply available to them. This can be done by increasing crop residues or adding an organic material such as poultry litter that will provide a C source for these microbes, or by directly applying C amendments to the soil. There is anecdotal evidence that liquid products–e.g. organic C, humic acid–will provide a soybean yield enhancement, presumably by increasing soil microbial activity that complements soil processes that increase nutrient availability to soybean roots that mine the soil for those nutrients.

Agricultural biologicals are important because they can promote diversity in current agricultural practices, and provide an alternative to chemical agricultural products. The ultimate goal from using effective agricultural biologicals and soil amendments is to enhance the growing environment for crops, and to enhance microbial activity that should result in improved soil health.

Factors that should be considered when selecting a soil amendment are: 1) the expected length of time the amendment will persist in the soil–i.e., will it have a long- or short-term effect on the targeted process; 2) soil texture at the site receiving the amendment since this will dictate the goal from adding a soil amendment–e.g., for sandy soils the goal might be to increase water and nutrient holding capacity, while the goal when adding an amendment to a clayey soil might be to increase porosity, permeability, and aeration, and to improve drainage; 3) soil salinity, and plant and microbe sensitivity to salts–i.e., ensure that a soil amendment will not add to the salt content of a soil that may already be high in that component; 4) salt content and pH of the amendment–i.e., do not add an amendment that will exacerbate these soil properties that may be problematic in soil at the site of its addition; 5) how and when should the amendment/additive be applied to ensure its maximum effect; and 6) the analysis of chosen soil amendments to ensure their properties will in fact be appropriate to affect the intended process at the site of application.

Time will be needed to conduct research that will provide results to either validate or dispute the claims that are made for new biologically-based soil amendments and products. However, this in no way negates the fact that soil amendments that will improve soil health, whether it be by improving physical, chemical, and/or microbial properties, are needed to either replace or complement synthetic additives that are currently being applied.

Dead microbes [microbial necromass or microbe corpses] are a large and significant component of soil organic carbon [SOC], and thus are crucial for long-term C sequestration and stabilization in the soil. It is reasonable to assume that cropland management practices will affect the accumulation of this material and its subsequent contribution to SOC. Just what practices have this effect and the amount of that effect are important questions to consider when attempting to increase SOC on sites where crops are grown.

When soil health is discussed, it invariably leads to/should lead to determining ways to enhance the soil microbial population that is instrumental in maintaining healthy and productive soils. This will lead to 1) increasing the soil microbial population for enhancing C sequestration in soil, and 2) the need to apply conservation agricultural practices over a long period (~> 10 years) in order to realize their full potential for improving the soil environment that is used to grow crops and support a robust soil microbial population.

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