Are Organic Matter Soil Amendments Created Equal?

The answer to that question is a definite “No.” Each class of material has specific characteristics and management issues when it comes to using it as a soil amendment. Typically, the idea behind adding any organic material to a soil is to enhance soil properties for desirable plant and beneficial soil microbial growth. The target soil properties for improvement in Utah and the arid/semi-arid Intermountain West are generally soil structure (aggregate formation and stability), soil water retention, plant nutrient content and retention, and stimulation of soil microbial activity important to nutrient cycling and plant nutrient availability.

In an upcoming post, I will detail the importance of organic matter in soils and discuss how much one should be regularly adding to reap its benefit. Today, however, I wanted to introduce you to the various classes of materials most often encountered, their inherent differences, and associated management issues. All the following are organic matter sources (once-living materials) but they may not be certified as “organic” soil amendments recognized for use in organic crop production. Such certification depends on the source and manufacturer/ supplier of the material.

Raw plant materials

This broad group of materials includes un-composted grass clippings, leaves, pruning waste, spent vines and vegetable plants from the garden, and plant-based kitchen waste such as peels, cores, etc. Most of these materials can be returned directly to the soil and will molder in place (especially if incorporated) providing much needed carbon for microbial growth, plant nutrients, and soil aggregate building blocks (gelatins, polysaccharides, etc.) as they decompose. These materials are also readily compostable.

Two things to consider when using materials from this group are surface area and woodiness. To increase the surface area for microbial access and ensure most rapid decomposition, chop or chip these materials as fine as possible before incorporation into the soil.

Woody materials are often too high in carbon content compared to nitrogen content and will need the addition of nitrogen if there is a worry of nitrogen tie-up in the early stages of decomposition. This period may last six to eight weeks, so supplemental nitrogen is necessary in actively growing areas such as gardens and flowerbeds. The recommendation is to add one pound of nitrogen for every 100 pounds of woody material incorporated.

Composts and Manures

The benefits of this group of materials are the same as that of the previous group. These provide carbon for microbial growth, plant nutrients and soil aggregate building compounds as they decompose in the soil. There is generally no concern with these materials tying up nitrogen as the carbon and nitrogen contents are better balanced. The two main concerns with the use of this group of materials are salt and weed seed content.

Many of the manures locally available, whether composted or raw, come from poultry, egg, dairy and beef production. The mineral content of the diets of these animals can be high, and excess mineral waste in the form of salts can be a problem in raw and often in composted manures. Analysis from the supplier or obtained by the user can help identify materials high in plant- and microbe-damaging salt levels. High salt levels are also possible in municipal plant waste composts available from many urban landfills. If the material is high in salt, additional low-salt water is required to flush the salts below the active root zone once incorporated into the soil.

Weed seed is mostly a concern with un-composted manures. Weed seeds can survive the digestion processes of most animals and remain viable in raw manures. The composting process generally results in the killing of weed seeds, but seeds may remain viable in under-composted manures (i.e., materials not brought to at least 140 F during composting).

Biosolids

This class of materials produced through the composting of municipal water treatment wastes is composed primarily of human waste and carries many regulations on its production and use. Class A category biosolids meet strict requirements for composting to kill human pathogens and denature many organic compounds that could present human health risks if directly ingested. These materials are not generally suitable, however, for application to gardens or in crop production settings where the material may contact edible plant parts.

Biosolids are very useful in land reclamation and range improvement, particularly on wildfire restoration sites where there is a critical need for increased water retention, plant nutrients and soil stabilizing compounds in fire-denuded areas. These materials may also be useful for soil preparation and enhancement under sodded areas in commercial landscapes, on landscaped roadway easements and other industrial landscapes, or for biofuel crop production where human contact with the material is minimal or the crop is not for human consumption.

Humates (Humic and Fulvic Acids)

This class of organic matter soil amendments has increased in availability over the past decade and claims to provide similar advantages to the other materials previously discussed. This class of materials, however, while certainly derived from organic matter, are generally organic residues left over after all decomposition ceases. These compounds commonly found in the persistent pools of long-term organic matter content in soils, are resistant to decomposition. Most of these materials are extracted in solid or soluble forms from soft coal deposits or other residual organic matter deposits (bogs, peats, etc.) and are, therefore, non-renewable, mined materials.

Because these materials are residual in nature and do not decompose further in soils, they do not provide soil aggregate building compounds that decomposition products common to the other groups of materials provide to soils. The plant nutrients contained in these materials are generally nutrients added to the products from external sources that adsorb to the surface of the material. These can be, and are released for plant use upon incorporation, but very low content coupled with very low rates of recommended application (due to their high cost), make them very minor sources of plant nutrients. These materials are, in fact, organic matter amendments and do offer additional surface adsorption sites for plant nutrients and water that may increase their retention in very poor quality soils, but they are applied at such low rates that their effect is often masked by native soil retention properties.

Post Note:

The above is not intended to promote or detract from the use of any listed material, but provides a basic understanding of properties important in optimizing their use in a given setting.

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