On-farm Composting:

Best Practices To Ensure On-farm Food Safety

Compost can be incorporated into the soil or used as mulch around plants.

What Is Composting and Compost?

Simply stated, composting is the controlled decomposition of organic materials by microorganisms. So mature compost is partially decomposed organic materials, while completely decomposed organic matter is called humus.

Benefits of Composting and Using Compost

- Composting reduces the volume of organic waste material that has to be handled and transported by 40-60 percent.
- Composting reduces and/or eliminates most plant and human pathogens in raw organic matter (such as manure or plant debris).
- Composting destroys viable weed seeds.
- Compost improves the soil structure and allows better tillage of the soil.
- Compost increases the soil's water holding capacity and fertility.
- Compost helps to buffer the soil from chemical imbalances.

Major Elements Required for Proper Composting

- **Moisture** – The ideal moisture level is 40-60 percent. Water is needed to transport materials in the pile and increase the accessibility of nutrients to the microorganisms. High moisture prevents air circulation inside the pile, resulting in lower pile temperatures and excessive odor generation.
- **Aeration** – Microbes need oxygen to efficiently decompose complex organic material into soil nutrients and to increase the temperature of the pile. But excessive aeration can result in the organic material being too dry.
- **Temperature** – The temperature of compost increases as the biological activity of the pile increases. The pile temperature must reach baseline temperatures to destroy pathogens and weed seeds.
- **Particle Size** – Size reduction accelerates the composting process by increasing the surface area available to the microorganisms, but exceptionally small particles can prevent air flow.
- **Carbon to Nitrogen Ratio** – The ideal carbon to nitrogen ratio is 30 to 1.

On-farm Composting Systems

- Turned Pile Composting – The temperature of the pile should be maintained at 131 degrees Fahrenheit or higher for 15 days or longer. During the period when the compost is maintained at 131 F or higher, there should be a minimum of five turnings of the pile.
- Aerated Static Pile Composting – The temperature of the pile should be maintained at 131 F or higher for three consecutive days.
- Nonaerated Static Pile Composting – This method takes the longest to produce finished compost, and the compost materials can be heterogeneous.
- In-vessel Composting – The composting materials are confined within a building, container or vessel with forced aeration or mechanical turning techniques to accelerate the composting process.

3 Phases of Compost

- Mesophilic Phase – Temperatures are lower than 104 degrees Fahrenheit.
- Thermophilic Phase – Temperatures range from 104 F to 149 F.
- Maturation Phase – Temperatures range from 50 F to 104 F.

Effects of Composting on Pathogens

The composting process can reduce microbial pathogen numbers in organic materials.

The pathogen population of the composted material is reduced by the high temperatures reached during the composting process. The longer high temperatures are maintained, the more the pathogen population is reduced.

The time frame required for this kill varies, depending on the inputs used for the composting and the conditions. Generally, time frames range from five to 15 days when the optimum temperature is maintained at 131 to 149 degrees Fahrenheit.

Monitoring the pile with thermometers is the only effective way to verify the required temperatures have been reached. Turning the pile when temperatures fall to 100 F is one strategy for ensuring thorough mixing and even heating of the compost pile. Monitoring weed seed kill is not an accurate method of determining that adequate temperatures were reached to kill pathogens.

Turning the pile to ensure all parts of the pile reach the desired high temperatures is important. Turning times and temperatures must be documented. The compost producer should be able to provide this information and verify the pile was protected from recontamination. Obtain copies of these documents from the provider and keep them in your farm records.

Compost Sources and On-farm Storage

- Compost producers should keep and provide records on all feedstocks and handling practices that ensure complete aerobic composting (such as temperature, aeration and moisture management, equipment sanitation and isolation and protection of curing piles).
- The compost producer must manage the compost pile to achieve an average high temperature in the 131 to 160 degrees Fahrenheit range for at least five days and confirm the pile was aerated or turned several times. Written records should be available and obtained for your records.
- Mature compost should be stored in an area that is physically isolated from produce handling facilities. Barriers or tarps should be used to minimize the risk of leaching, runoff, wind movement and possible recontamination by wild or domestic animals. An alternative to storage is to immediately apply the compost to the desired fields when it is received.

Compost Application

- No compost teas should be applied to produce because no safe pre-harvest intervals have been determined.
- Mature compost should not be side-dressed or top-dressed on any produce crops.
- Crop residues or cover crops always should be used to minimize compost runoff from fields. In addition, cover crops or "filter strips" always should be used at field boundaries and along water courses to minimize compost runoff.
- Detailed records should be kept about fields receiving compost, including the rate, applicator, application method and date of application.

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