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Using Compost Thermometers to Improve Compost Efficiency and Safety

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Composting is a biological process that transforms organic materials such as manure, food waste, animal mortalities etc. into a nutrient rich soil amendment. On the outside composting may appear like a simple process, successful composting depends on careful management of several factors, including but not limited to carbon, porosity, moisture etc. Among these, temperature is perhaps the most crucial indicator of compost activity, we'll look at why a little later in this letter. A compost thermometer is simple, yet effective tool to monitor temperature and make informed management decisions.

You may find yourself asking the question “why does temperature matter in composting?”. Well, temperature is an indicator of compost activity, in other words it tells you how well the bacteria inside the compost are performing. As microorganisms break down organic matter, they generate heat as a byproduct of metabolism. When conditions are favorable, this heat builds up, and raises the internal temperature of the compost pile. Monitoring this temperature, helps determine if the composting process is progressing efficiently. High temperatures indicate microbial activity and matter breakdown, extremely high temperatures indicate a potential fire hazard, while low temperatures indicate that something is inhibiting the composting process.

For these reasons compost temperatures must be maintained within an optimal range, about 120 to 140 F, this is the range at which organic matter breakdown is most efficient. So, how do you know the temperature of the compost? Well, you need a compost thermometer. Compost thermometers are designed to measure internal compost pile temperatures. Most compost thermometers consist of a long probe between 18 and 36” in length, attached to a dial or digital display, with the very tip of the thermometer being the actual probe that measures temperature. This design allows users to measure temperatures deep within the pile without disturbing the pile.

Using a compost thermometer is incredibly simple, the probe should be inserted into the compost pile at such a height and angle to reach the center of the pile, where temperatures are typically the highest. Care should be taken to avoid accidentally putting the thermometer into the base, where temperatures will be low. Compost piles go through several phases of activity, heating, cooling, and finally curing phases, without a thermometer to take temperatures there is no way of telling what phase a pile is in.

Temperature readings, when properly interpreted can give valuable insight into compost conditions and overall performance. When temperatures rise into the thermophilic range, it indicates that microbial activity is strong and decomposition is proceeding efficiently. Sustaining temperatures in the range is crucial for effective pathogen reduction.

If temperature never increases, or increases slowly, or stops increases before reaching the thermophilic range, this is an indicator of potential problems. Problems that include improper moisture content, nutrient balance, or poor aeration. Fortunately, these problems are fixable, but if you don't measure temperature, you will have no way of knowing if there is a problem, and what that problem might be.

Temperature trends are equally as important as high or low temperatures. A decline in temperature after a thermophilic period indicates that readily available materials and oxygen has been consumed and that turning is needed to reinvigorate the process. Again, something that is critically important to the overall composting process and the final product, that would not be known if temperature was not monitored.

Temperature monitoring is important when composting materials that may contain pathogens, such as manure, poultry litter, carcasses etc. Many state and federal guidelines specify exact temperatures and times that must be met to be considered safe, without a compost thermometer you would never know.

Not only is having and using the compost thermometer correctly crucial, but thermometers must be calibrated regularly to ensure accuracy. Fortunately, calibrating the thermometers is quick and simple, all you need is a container, ice and water. The poultry science extension team has a quick instructional video on how to perform a calibration. To check that out you can follow this link: https://youtu.be/rW_BedMybz0?si=uR-VU5b4P1uoW3ET

A compost thermometer is a simple, low cost tool that provides valuable insight into the performance of a compost pile. Regular temperature monitoring and response to temperature changes, gives producers the opportunity to improve compost performance, enhance end product quality, and help control pathogens. Consistent use of temperature data supports good decision making, and can help achieve reliable and repeatable compost outcomes across a wide range of operations.