Composting Poultry Mortalities

Cooperative Extension Service • The University of Georgia College of Agricultural and Environmental Sciences • Athens

Burying dead birds in disposal pits is a common practice for poultry growers. Composting has been developed as an alternative method of using dead birds in a more environmentally sound manner. The composting process converts dead birds into a brown humus-like material that can be spread on the land for crop utilization and soil improvement. This relatively inexpensive method of composting dead birds is gaining acceptance throughout the poultry industry.

PRINCIPLES OF COMPOSTING

Composting is a natural, biological process by which organic material is broken down and decomposed. The composting process is carried out by bacteria and fungi which digest the organic material and reduce it to a stable humus. The principles of composting are quite simple -- just provide the microorganisms with an environment conducive to their growth -- a balanced diet, water and oxygen.

The essential elements for the microorganisms involved in composting are carbon (C), nitrogen (N), oxygen (O_2) and moisture (H_2O). If any of these elements are lacking, or if they are not provided in the proper proportion to one another, the microorganisms will not flourish and will not provide adequate heat. The ratios of these elements ideal for composting dead birds are provided in detail in the Composter Management and Operation section of this publication.

The microorganisms best at composting are aerobic; that is, they require oxygen to live. During the composting process oxygen is used up quickly by microorganisms inside the compost pile. Aerating the compost by turning it allows oxygen to be resupplied to these microorganisms and for the composting process to continue at a rapid rate.

Water is essential to the growth of any living organism. Composting microorganisms thrive in moist, but not soggy, conditions. Desirable moisture levels in the composting materials should be 40 to 60 percent. Too much water can cause the compost pile to become anaerobic; too little will prevent microorganisms from reproducing to adequately high numbers.

A temperature in the range of 130° to 150°F inside the composter pile is evidence that a composter is working well and that the composter environment is suitable. These high temperatures are produced by the biological activity of the microorganisms that are breaking down the organic material in the pile and are beneficial to the composting process. High temperatures enhance the growth and reproduction of thermophilic (heat loving) bacteria that are especially good at digesting organic material. The heat produced by the microorganisms not only contributes to their own growth, but also speeds up the decomposition process and helps in killing pathogenic microorganisms.

COMPOSTER MANAGEMENT AND OPERATION

The requirements for proper and complete decomposition of dead carcasses are reasonably simple, but proper management is essential.

Decomposition of the dead carcasses and litter depends upon microbial activity. The greater the microbial growth, the faster the carcasses decompose. Anything that slows down microbial growth lowers the temperature of the composting material and slows the composting process. The more rapid the microbial growth, the greater the heat output and temperature of the composting mass, and the more rapidly the mass breaks down.

The microorganisms responsible for composting are initially supplied by active litter. The microbes in the litter used in the composting process need to be kept alive and in sufficient numbers so that the composting process can begin immediately to break down the carcasses and the litter. Litter that is too dry and too long removed from the house will contain very low numbers of microorganisms. Use of old dry litter which contains low numbers of the necessary microorganisms slows the process of carcass decomposition. Litter that is too dry or old should be activated before it is used in the composting process. A quantity of litter to be used in the next week, can be activated by increasing the moisture content up to 40 percent and stirring the pile to add needed oxygen. The microorganisms in the pile will again begin multiplying, raising the temperature of the litter. When hot, the litter is ready for use in decomposing carcasses.

Oxygen is initially supplied when the carcasses and litter are placed into the composter. If all the necessary requirements for composting are in the correct proportion, composting will begin immediately with a corresponding rise in temperature to between 130° and 150°F in a few days. As oxygen becomes limited, microbial growth will slow and the temperature of the mass will decrease. More oxygen is available from both coarser litter and larger volumes of litter, resulting in a longer composting process before the temperature drops.

If the litter is too fine, air (thus oxygen) will be limited to the microorganisms, causing them to grow slowly. Slower microbial growth results in a lower composting temperature with slower digestion of the birds. At a temperature of 150°F, the birds decompose about twice as fast as at 130°F. If the temperature of the compost reaches only 130°F, birds nearer the walls where it is cooler will decompose very slowly.

The composting product can be sustained at higher temperatures by using a bulking agent which creates air pockets in the compost pile and thus supplies more oxygen to the composting process. A coarse material, such as wood shavings, straw or peanut hulls will ensure more oxygen, allowing higher composting temperatures. Also, adding more litter or litter cake increases heating. If litter cake is used, little or no bulking agents are needed.

Proper management and operation of the composter is relatively easy if the manager understands the basic principles outlined in the previous paragraphs. The amount of labor required to compost birds is reasonably low.

The ingredients that go into the composter must be layered in as follows:

1. An initial layer of 8 to 12 inches of active (warm) litter with 40 percent moisture should be placed on the floor. This litter will supply bacteria and heat to start the process. This layer will also help in absorbing moisture if excess water is added to the composter. (The base layer should not be placed more than a few days prior to use for composting birds or it will cool as bacterial numbers reduce when moisture or oxygen becomes limited.)
2. Unless litter cake is used which is bulky with much air-holding ability, a thin layer of peanut hulls, coarse shavings or straw is added next.
3. A layer of dead bird carcasses are added next. The carcasses should be arranged in a single layer side by side, touching each other. Carcasses should be placed no closer than 5 to 6 inches to the walls of the composter. Carcasses placed too near the walls will not compost as rapidly, since the temperature is cooler near the walls.
4. A layer of litter with 40 to 45 percent moisture is added next. This layer should be twice as thick as the layer of carcasses underneath.
5. If only a partial layer is needed for a day's mortality, the portion used should be covered with litter. The rest of that layer can be used with subsequent mortality.
6. A small amount of water may be needed after each layer. If much water is required, the litter is too dry and probably low in live bacteria.
7. After completing the initial layer, subsequent layers of litter, bulky ingredient and carcasses follow until a height not exceeding 5 feet is reached. The last layer will be a cap of litter. Excessive height increases the chance that the composter temperature will exceed 160°F with the chance of spontaneous combustion.

Composting begins as soon as the loading begins. Depending on the size of the primary cell and the number and size of carcasses, the loading time will vary. With active litter, a week's loading time may allow the lower levels to rise to 150°F by the time the cell is capped. The temperature should be monitored and recorded daily. When oxygen becomes limited, the temperature of the compost will begin falling. By the time it drops to 130°F (about 7 to 21 days after capping) the compost can be moved to a secondary cell. The purpose of moving the product is to remix and aerate the product so that a faster, more complete breakdown of the compost occurs. The movement to a second cell will probably be necessary to get adequate decomposition if the birds exceed 4 1/2 to 5 pounds or material is removed from below and added above.

The product temperature should again rise to 150°F within days. Delayed movement, poor aeration, poor mixing or moisture above 60% or below 40% will cause the mass not to heat properly.

Once the temperature determined by daily monitoring drops from 150°F to 130°F (7 to 21 days), the product can be moved again to await its use as a fertilizer on the farm where the product originated.

The carbon to nitrogen ratio is discussed in several sections of this publication. In summary, birds have a C:N ratio of 5:1, litter ranges from 7:1 to 25:1, and straw 80:1, peanut hulls 50:1, and shavings are 300-700:1. If 2 parts by volume of litter and 1 volume of dead birds and adequate bulking agent is contained in the litter or added prior to the carcasses, the C:N ratio should be adequate.

RESOURCES AND REGULATIONS

Policy for Obtaining a Composting Permit

In order to obtain a permit for composting poultry mortalities, Georgia growers must submit a written request to the State Veterinarian describing the procedure and type facility to be used. Composting procedures developed by the Soil Conservation Service, Agricultural Stabilization and Conservation Service, Resource Conservation and Development Council Incorporated or the Cooperative Extension Service must be used. The letter requesting the permit must include

where they are then shoveled by hand back to the top to compost new dead birds. A five gallon bucket of new litter material is normally added to each composter each week. A few operators will add a small amount of bulking agent such as peanut hulls or cotton seed hulls to trap oxygen and promote heating.

A second composter is the small bin Delmarva type composter (figure 2) which is the most popular among poultry producers. The front wall of these bins consist of 2-inch thick boards which are mobile to help with filling and removing the material to be composted. The material in the composters is moved with some type end loader or skid steer loader. Therefore, the width of the small bin composter must allow the loader bucket to get into the bin. Normally these small bin composters will be 8-10 feet wide by 5 feet high and 5 feet deep. The depth is limited to 5 feet due to the reach required to drop the composted material into the secondary bin which is immediately behind the primary or small bin. Moving the material from the primary bin to the secondary bin after 10 to 21 days is common for Delmarva type composters to mix oxygen into the mass to promote heating. The oxygen is added as the mixture is dropped or moved from the primary bin to the secondary bin.

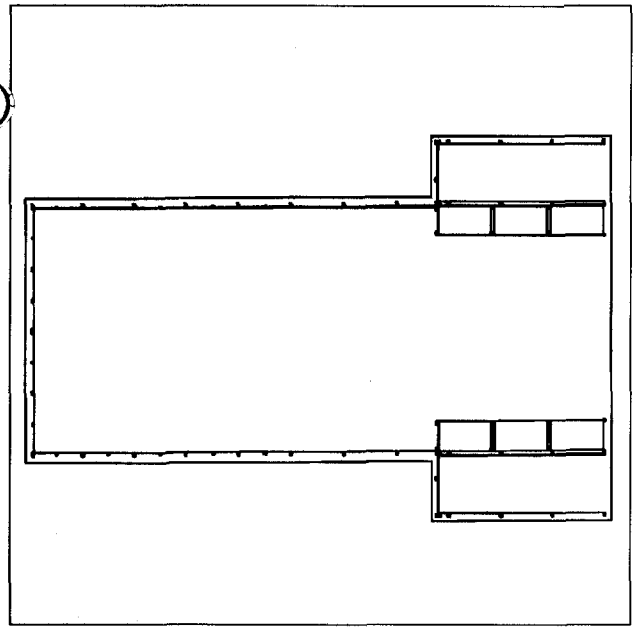

Figure 2. Small Bin Composter-Plan View

The third type is a big composter (Figure 3) which is an adaptation of the Delmarva type small bin composter. The big bin uses a primary bin which does not have a removable front. In fact, the front is totally open and the compost material slopes back slightly with the front face of the composted material standing at an angle of about 70-75 degrees. The front face of the pile must slope back slightly because the material will not stand on a vertical angle since no front wall is present for support. The larger growers like the big bin composters. The big bin type composter is normally 10 to 12 feet wide and 20 to 50 feet or more in length. The primary and secondary bin is usually side by side or parallel to each other and built like a bunker silo. The big bin composter, like the small bin type, is filled to a height of 5 feet.

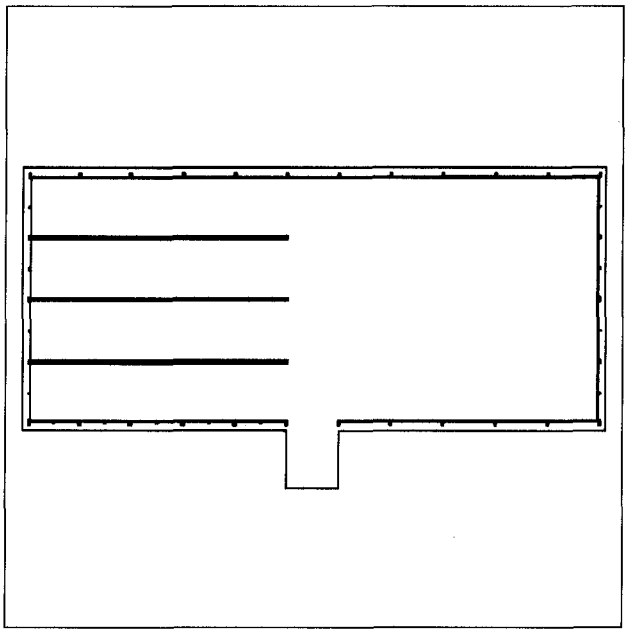

Figure 3. Big Bin Composter-Plan View

Yet another type of composter which can be used inside the broiler house (birds up to about 5 1/2 to 6 pounds) is the minicomposter. These may be as simple as four pallets tied together at the corners and lined with wire mesh to make a cubical (Figure 4).

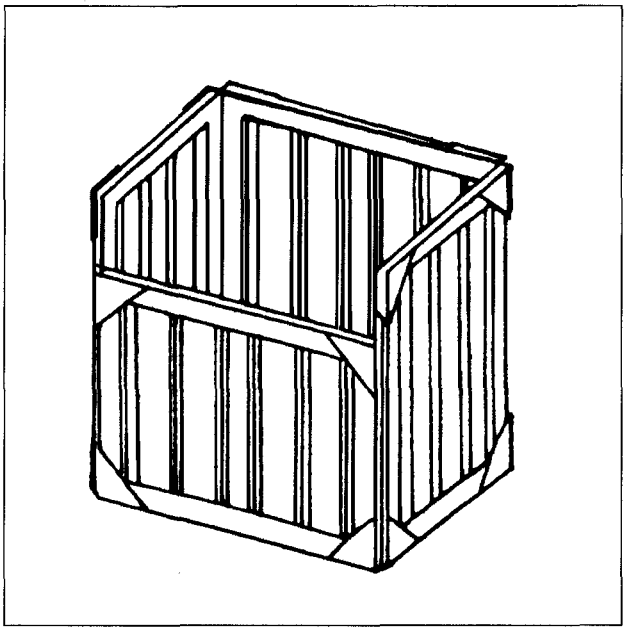

Figure 4. Minicomposter

Minicomposters will decompose broilers in one cycle without moving into a secondary bin. Some poultry companies are hesitant to use the minicomposters inside the broiler house. Check with your company before using this method.

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Circular 819-15 October 1994

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, The University of Georgia College of Agricultural and Environmental Sciences and the U.S. Department of Agriculture cooperating.

C. Wayne Jordan, Director

94-130