Meat Chicken Technical Environmental Note 5

Composting Carcasses in Open Bays and Piles

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Introduction

Composting carcasses in open bays and piles is an environmentally and biologically safe alternative if performed correctly. A major advantage is the production of a nutrient rich humus-like material that can be used as a fertiliser and/or soil amendment. However, composting facilities need to be designed and managed correctly to avoid any bio-security issues.

Basic Elements

Moisture

The optimum moisture content for carcass composting is around 50%. The compost should be moist, but not soggy and you should not be able to squeeze moisture from it. If the compost is too dry (less than 40%) the process slows, as there is insufficient moisture for bacteria survival. If the compost is too wet (above 60%) the process is likely to become odorous as the water excludes the oxygen needed to maintain an aerobic environment. Decomposition by aerobic microorganisms produces very little odour compared to the highly odorous organic acids and hydrogen sulphide produced by anaerobic digestion.

Co-composting material

Adding a co-composting material to the carcasses provides additional carbon, which helps to maintain a high level of microbial activity. On meat chicken farms, the most readily available co-composting material is the spent litter, provided it does not contain excessive moisture. Advantages of adding a suitable co-composting material include:

- By surrounding the carcasses with a co-composting material, the potential scavenging by animals will be mostly eliminated.
- A porous co-composting material maintains oxygen levels in the carcasses and promotes escape of the ammonia produced by digestion, which would otherwise inhibit microbial activity.
- Excess liquid released by the decaying carcasses will be absorbed.

Carbon, nitrogen and oxygen

Carbon (C), nitrogen (N) and oxygen (O) are key elements in the composting process. Without an appropriate balance of carbon and nitrogen, limited microbial growth will inhibit the decay rate. Optimum C:N ratios are around 25:1 to 30:1. Although composting will proceed with C:N ratios of 10:1 to 50:1 the process will be

slower and less effective. Low C:N ratios tend to produce more ammonia, which inhibits breakdown. High C:N ratios may also inhibit breakdown through limited available nitrogen. This can be remedied by using a substrate with a higher nitrogen content or by adding granular nitrogen fertiliser. Adequate oxygen must be available to keep the pile aerobic.

Heat retention

The temperature inside properly sized and maintained compost piles should reach 50- 65 ^{o}C. This temperature stimulates the growth of the thermophilic bacteria that promote decay. It also helps to destroy disease-causing microorganisms. For a meat chicken farm this improves biosecurity and produces a product that is safe for land application. Compost piles are likely to be cooler close to the edge, so carcasses should be kept at least 300 mm from the edge of the pile.

Compost Bin Design

Compost bins can be as simple as large round or large square hay bales configured into an open-fronted bay. They need to be set up on an impermeable pad (compacted clay or preferably concrete). Many of the carcass composting operations in the United States are conducted in open sheds. This design allows for improved environmental control, by excluding rainfall. The sidewalls of these shed structures can be constructed of timber, concrete or plywood with timber supports. Bins are generally 2 m deep and approximately 2.5 m wide. The width needed depends on the implements available for turning (front-end loader, bobcat etc).

CHICKEN COMPOST SHED COMMONLY USED IN THE UNITED STATES

Size of Operation

A 100,000 bird operation with 4% mortality rate will produce approximately 5 t of mortalities per batch or an average daily mortality of about 100 kg for the batch. An average daily bird loss of 100 kg/d will require approximately 12.5 m^3 of bin capacity (6.25 m^3 for the primary bin and 6.25 m^3 for the secondary bin).

Operating Principles and Management

The compost pile should be started with a 150 mm layer of clean bedding material (sawdust, shavings etc.) on the base to absorb any leachate that may be released from the pile. Next, place 150 mm layer of co-composting material (dry spent litter). Carcasses are then placed in single layers on top of these base layers. All carcasses should be at least 250 mm from the side walls to ensure adequate coverage for aerobic decomposition and to avoid leachate exiting the pile.

Each layer of birds is covered with at least 150 mm of co-composting material. This procedure is continued until the bin is full. The top layer of birds should be covered with at least 300 mm of co-composting material to ensure there is no scavenging or fly breeding. This cover will also ensure little odour is released during the operation.

The pile should heat up to 55-60^{o}C within 24-48 hours. If this does not occur, it will generally be due to a lack of or an excess of moisture. After the bin is full, it needs to undergo a primary composting phase of 10-14 days. During this time, the microbial action will deplete the oxygen and the temperature will fall with a slowing of the decay process.

After this primary cycle, the partially composted material is removed and placed in a secondary bin. The moving of the pile aids in mixing, which redistributes excess moisture and introduces more oxygen. This promotes further composting and decomposition. After another 14 days the composting process should be complete. For heavier carcases (exceeding 3kg), a third composting phase may be required. The composted product can then be stored for further curing or be available for use as a nutrient rich by-product. It is important that the compost piles are either turned or moved during the process to introduce new oxygen and avoid odour generation.

COMPOSTING CHICKEN CARCASSES IN OPEN BAYS

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