Aviagen® Turkeys

Bulletin

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Issue 45

Windrow Composting of Turkey Litter

Introduction

Litter in turkey finishing barns may be composted so that it can be reused for bedding subsequent flocks. It is not uncommon for litter to be reused for four to six flocks with short-term windrow composting between each flock. When done correctly composting lowers pathogen counts, gives the litter a uniform texture, and removes a significant amount of ammonia.

There are various reasons for composting litter including:

1. Government may require composting the litter if there is a regulated disease outbreak such as highly pathogenic avian influenza. In this case, the composting will be done for a long period of time under government control. Litter may then have to be discarded after testing negative for virus.

2. Composting and reusing litter may be done to reduce costs. New wood shavings are expensive, so litter is routinely reused in finisher barns for this reason. Composting is part of a process to rejuvenate the litter and improve its characteristics for use with the new flock of young turkeys.

3. Litter may be composted and reused in emergency situations when new bedding materials are not available.

The purpose of this article is to describe the most common method of composting turkey litter – windrow composting inside the turkey barn. Achieving a good result depends on having adequate litter moisture, adequate carbon content, and enough time for the process to be effective.

Figure 1 Windrow in a Turkey Barn

Steps for Successful In-house Windrow Composting

1. Empty any amount of residual feed from the feed system into the litter.
2. Perform initial wash-down of the building if any is to be done. This will add some moisture to the litter. Eliminate this step if litter is already too wet (moisture level above 60%).
3. If possible, rototill the litter to bring it to a uniform consistency. Badly caked or very wet areas may need to be removed from the barn if the litter is already very wet.

4. Using a tractor or skid-steer loader pull the litter away from the walls. Make a first application of approved insecticide along the walls.
5. Push litter into a windrow in the center of the barn. Significant mixing of the bedding materials and manure will take place during this process.
    a. Equipment is available that can both move the litter into a windrow and blend it.
    b. Good size for windrows is 3–5 feet (1-1.5 meters) high and triangular shaped.
    c. Once windrows are constructed make a second application of insecticide around each windrow.

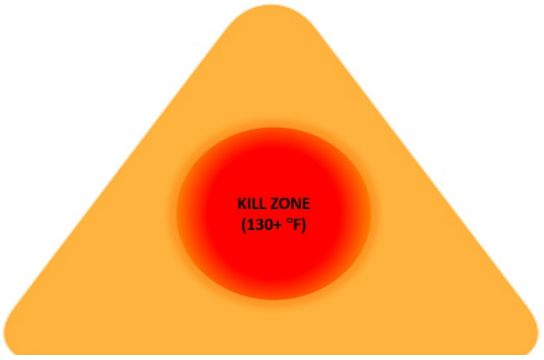

Figure 2 Cross Section of a Triangular Shaped Windrow with Target Internal Temperature

6. Check moisture levels in several different locations over the length of the windrow.
    a. Moisture level needs to be 35% - 60% for effective composting.
    b. If not above 30% moisture should be added.
    c. If you cannot do actual measurements just fill your hand with litter and squeeze it. If moisture is above 35% it will stick together.
7. Composting is most effective in warm weather. Curtains should be left open and/or power ventilation should be operating if ambient temperatures are above 40°F (4.5°C).
    a. This will help evacuate ammonia and moisture products of composting.
    b. Even in very cold weather minimum barn ventilation should be maintained.
8. Proper PPE should be supplied to operators during composting.
    a. Ammonia levels can be dangerously high when composting is done in a closed barn.
    b. Some areas of the windrow will have temperatures that encourage rapid growth of Aspergillus. Airborne mold may become a danger when the windrow is turned. Proper respiratory protection should be supplied, and positive ventilation should be continued during the turning process.
9. Check temperatures in the center of the windrow to confirm that adequate composting is occurring.
    a. This is easily done with a "litter thermometer" with a probe that is 18 – 24 inches (45-61cm) long.
    b. Temperature needs to be 131 – 150°F (55 – 65°C) for 2 - 3 days to kill pathogens.
    c. Outside parts of the windrows will not reach these temperatures.
    d. The bottom of the windrow will be much lower in temperature than the center of the windrow. This is because the soil or concrete act as a significant heat sink.

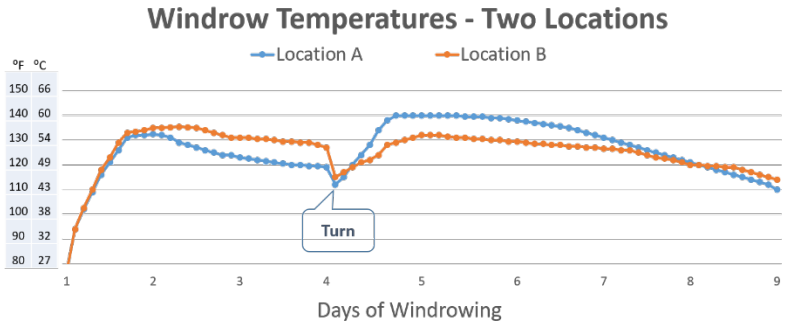

Figure 3 Temperature Profile of Windrow

Figure 4 Checking Temperature with a Litter Thermometer

10. If time and equipment allow, and maximum pathogen kill is needed, the windrowed materials should be turned one or two more times after peak temperature is achieved (on about day 3 and then again on day 5 or 6).
    a. Subsequent turning of the windrow allows the movement of external windrow materials into the center of the windrow where they can be fully heated.
    b. This turning also re-introduces oxygen into the windrow which will then enable further decomposition of the litter by aerobic bacteria.
11. On days 7 – 9 spread the composted litter evenly in the building.
    a. Allow three to four days for residual ammonia to dissipate from the composted litter.
    b. Actively ventilate the barn during this period. If at the end of this period there is still excess ammonia present (above 20 ppm) an approved litter amendment should be added to suppress the ammonia.
    c. If additional bedding is required it can be added after the airing-out period is completed.

Potential Problems

Some problems that can occur during the windrow composting process are as follows:

Problem	Solution
Litter that has been used several times and is mostly manure does not have enough carbon source to heat up and compost thoroughly.	•Carbon source materials (wood shavings, straw) can be added as the windrow is built.
Litter is too dry and will not compost.	•Add water until moisture level is above 30%.
Litter is too wet and will not compost.	•Add drier litter or straw/shavings or other bulking materials to the mix.
Brooder house litter can be difficult to compost if it has too little manure in it.	•Single-use brooder litter is better used as a bulking agent for composting litter in finisher barns, or simply for top-dressing finishers after de-caking.

It is important to note that succesful composting takes time. Tight production schedules and short between-flock turn times may render the process partially or totally ineffective.

The reason for composting will dictate the amount of time needed:

Only mild rejuvenation of the litter is needed: short mixing/composting times may be okay.

Severe reduction in pathogen numbers is needed: Longer composting periods, combined with repeated turning of the windrow will be needed.

- Pathogens such as salmonella, campylobacter, Pasteurella and E. coli can be destroyed at normal composting temperatures.
- Clostridia species will also be killed at normal composting temperatures. However, the barn cannot be considered free of clostridia. Spores of this organism will survive the composting process, especially in the cooler parts of the windrow.

NOTE: Do not think of the composting process as an eradication procedure for bacterial pathogens. It is almost impossible to subject all parts of the litter mass to high enough temperatures to kill all bacterial pathogens. The process will reduce pathogen load. It will not sterilize the litter.

Final use of the composted litter

If the litter will ultimately be spread on crop land it should be used at correct agronomic rates. Turkey litter will be high in phosphorous in relation to nitrogen. If applied at nitrogen-required rates, the soil will quickly become saturated with phosphorous. Litter applied at nitrogen requirement rates will provide five times too much phosphorous. Farmers should consult with local Agricultural Extension personnel to determine appropriate application rates and frequencies.

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