NOVA SCOTIA Agriculture and Fisheries
Nova Scotia Agricultural College
fact sheet

On-Farm Composting of Mink Manure

Mink Manure Management

Fur animals, such as the mink, produce manure rich in nitrogen (N) and phosphorus (P). If not properly managed, this manure has the potential to pollute water systems through runoff of P, and pathogens.

With increasing environmental concerns over manure storage and handling systems, composting can be a useful component of farm manure management. It serves as an environmentally acceptable process for converting mink manure (Fig. 1), into a stable end-product that is odourless and pathogen-free.

Figure 1. Stockpiled mink manure.

Composting

Composting is an environmentally responsible process that results in a stable end-product which can be used as an on-farm fertility source. Composting reduces organic material to a stable material similar to humus. Several different composting methods can be used, however the most common on-farm application includes piling manure in a heap or windrow. The area selected for composting should be located on high ground, be well drained and at least 100 m from nearby wells or surface water.

The amount of time required to transform raw materials into compost depends on the feedstocks being used, along with many other factors including the initial carbon to nitrogen (C:N) ratio, moisture content, temperature and mixing frequency (aeration).

If optimum composting conditions are met, mink manure may be composted in 120 days. The process may require more time however, if the moisture content is not maintained at an appropriate level. Finished compost should be uniform, dark brown in appearance and odourless.

The benefits of composting are:

- It lessens disposal problems associated with large volumes of manure by reducing the bulk volume by 20–60%;
- It may be spread at the convenience of the producer, with less cost and labour involved than spreading raw manure;
- It enhances physical and chemical properties of the soil, improving tilth and nutrient balance;
- Compost nutrients are in a more stable form with less chances of leaching into ground and surface water systems; and
- It reduces pathogens and weed seeds (if temperatures exceed 55°C)

Carbon-Nitrogen Ratio

In order for the composting process to occur, microorganisms require a carbon (C) source for growth and an N source for protein synthesis. The C:N ratio is the weight of C divided by the weight of N in the material to be composted. In composting mink manure and sawdust (Fig. 2), an initial C:N ratio of 25:1 best facilitates the composting process. Failure to meet this ratio will result in the following:

< 25:1, N losses are increased, decreasing the value of the end-product.
> 35:1, process will require more time.

Figure 2. Mink manure and sawdust compost.

Fresh mink manure is rich in N and generally has a low C:N ratio (7:1). Although bedding is often mixed in the manure, additional C is often required. Common C sources include sawdust, straw, wood shavings and hay. Determining the amount of manure and C to add to a pile requires an analyses of the raw materials.

Nitrogen and C analyses may be conducted at the Nova Scotia Department of Agriculture and Fisheries, Quality Evaluation Services Laboratory. Producers interested in composting should contact their regional agricultural resource co-ordinator, who will facilitate the testing of raw materials.

Determining Feedstock Quantities

When adjusting the C:N ratio of a mixture for composting, the C:N ratio of each individual material needs to be considered. The following example demonstrates how to achieve an initial C:N ratio of 25:1 in compost consisting of mink manure and sawdust. For each kilogram (kg) of manure, the amount of sawdust (X) to add is as follows:

$$C{:}N = \frac{[Xx(C \text{ in } 1 \text{ kg sawdust})] + (C \text{ in } 1 \text{ kg manure})}{[Xx(N \text{ in } 1 \text{ kg sawdust})] + (N \text{ in } 1 \text{ kg manure})}$$

For this example, assume that the manure and sawdust contains the following:

Parameter	Manure	Sawdust
C (g/ kg dry matter)	126.0	1200.0
N (g/ kg dry matter)	16.7	2.4
C:N	7.5:1	500:1

Inserting these values into the equation above and solving for X generates the following:

$$1200X + 126 = 25\,(2.4X + 16.7)$$
$$1200X - 60X = 417.5 - 126$$
$$1140X = 291.5$$
$$X = \frac{291.5}{1140}$$
$$X = 0.25$$

Therefore, for every kg of manure, 0.25 kg of sawdust would need to be added to produce a C:N of 25:1.

Aeration

Generally, smaller particles (e.g. sawdust) require more frequent mixing than larger particles (e.g. straw).

The ability of a compost pile to retain oxygen depends on the amount and size of air spaces within the pile. If the pile is too wet, water will replace air spaces, leading to the production of leachate and odours.

Mixing is generally performed with the use of a front-end loader. Adding a compost mix in a manure spreader and then stationary spreading has been found to be effective in aerating mink manure compost. (Fig. 3)

It is strongly suggested that compost be situated on a concrete pad with at least one wall to aid in the turning of the piles. Compost should be mixed when the moisture content is too high or when the temperature begins to decrease.

Moisture Content

The moisture content of the compost is important and is reflected by the temperatures within the compost pile.

Although 40–60% has been stated as a suitable moisture range for composting, 60–65% appears to best facilitate the process of composting mink manure. Composting may be inhibited by the following moisture conditions:

<40%, organic material will not decompose rapidly; and
>65%, the process will become saturated (and anaerobic), resulting in the production of leachate.

If the optimum moisture content is not maintained, the compost will also fail to produce high temperatures (>45°C).

The texture of the compost serves as a general moisture content indicator. At the proper moisture content, compost should be damp, and should form a ball when squeezed. If water can be squeezed out of the compost, the moisture content is too high, and compost should be turned.

Figure 3. Mixing of manure and sawdust with a front-end loader and a manure spreader.

Turning will help to increase the evaporation from the pile. However, if the compost is dry and crumbly, the moisture content is too low and water should be added.

Generally, 95 L (25 gallons) of water will increase the moisture content of 1 tonne of manure by 10%. The addition of water should occur while the pile is being turned, to ensure that all areas of the compost receive water.

The moisture content of compost is highly weather-dependent, therefore the following points should be considered:

Watering is generally required during hot, dry weather, when the compost becomes too dry;
During periods of high precipitation, compost should be covered to reduce the production of leachate and to protect the compost from becoming anaerobic; and
Cold weather may also create difficult conditions for composting. Compost moisture content will have a large effect on whether the pile freezes. High moisture compost (>65%) will freeze if the air temperature drops below 0°C.

Protecting the compost from precipitation by covering the compost pile with a tarp will reduce leachate conditions.

If leachate is produced, it should be collected and redistributed when the compost requires moisture or treated as leachate runoff.

Temperature

The composting process involves various temperature stages. Through bacterial action, temperatures will reach 50–70°C within the first 2 to 3 days of composting. High temperatures will eventually begin to decline after 2 to 3 weeks, at which time the cooling stage (30–35°C) will begin. In composting mink manure, there are three temperature thresholds to consider:

The thermophilic threshold (45°C) indicates that high-rate composting is occurring;
The pathogenic threshold (55°C) is the temperature at which most pathogens and weed seeds are destroyed; and
The Aleutian Disease threshold (60°C) is the temperature at which the AD virus may be destroyed.

Temperature may be monitored 3 to 4 times a week by inserting a long thermometer (60 to 90 cm) into the central region of the pile, where most of the heat is produced. Thermometers may be purchased at local hardware stores.

Generally, if the inside of the pile is cool and the outside is hot, the pile is either too wet or lacking oxygen, and should be turned. If the outside of the pile is cool and the inside is hot, the pile is too dry and water should be added when turning. Temperature data (Fig. 4) collected while composting mink manure with sawdust has clearly demonstrated that covering the piles to protect them from rainfall results in increased temperatures. The composting process produces temperatures above the three thresholds previously mentioned for a covered pile and close to the highest threshold of 60°C for an uncovered pile..

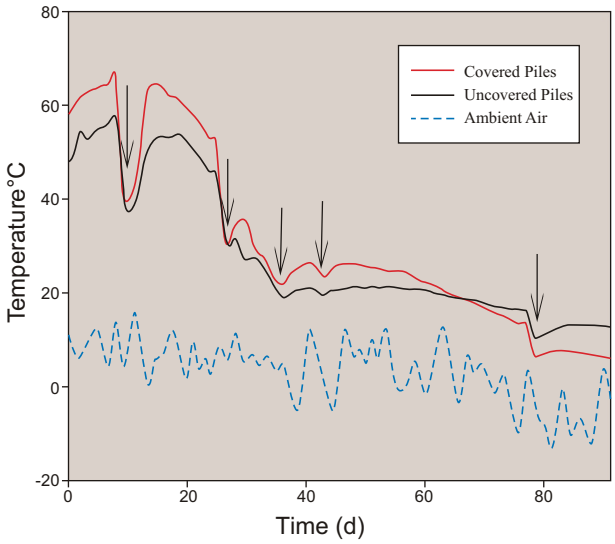

Figure 4. Temperature profiles of covered and uncovered mink manure compost and the ambient air temperature. Arrows indicate when compost was turned.

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