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Composting Horse Manure[1]

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Management of horse farm wastes is an ever increasing problem for horse owners and horse facility managers. This is especially true where horses are stalled and land availability limited. Examples of the latter include race tracks, training centers, horse show complexes, public stables, and even some private horse farms.

In the past, these materials have been piled on unused land, deposited in ravines and eroded ditches, hauled to landfills, burned, and used as soil amendments for cropland. With the increasing emphasis on the control of environmental pollution, many of the above options are no longer acceptable. Alternative utilization or disposal procedures are essential. One of the most promising alternatives is the conversion of the materials to organic soil amendments via composting. Composted horse manure can be used to increase the organic matter content and thus the water and nutrient holding capacity of sandy soils in agricultural and home gardening settings. The material can also be used by plant nurseries as potting soil and is an excellent media for the production of mushrooms, fish worms, etc.

Horse stall wastes include feces, urine, bedding material, hay, and sometimes waste feed. Bedding materials make up a large portion of the waste and may include straw, wood shavings, sawdust, grass hay, peanut hulls, shredded paper and other locally available products. These products are characterized by their high organic matter content, bulky nature, high absorption ability, and low nitrogen content.

Composting is a method whereby the organic component of the solid waste is biologically decomposed under controlled conditions to a state in which it can be handled, stored, and applied to the land without adversely affecting the environment. A key phrase in the above definition is "under controlled conditions." This distinguishes composting from the biological decomposition processes which occur naturally, and it also differentiates composting from some objectionable practices such as open dumps, piles of rotting manure, and other accumulations of waste materials.

There are two types of composting systems, aerobic and anaerobic, and many procedures for accomplishing each. Aerobic composting implies decomposition in the presence of oxygen. Most commercial composting systems are aerobic, since anaerobic systems are more likely to produce foul odors. Even though aerobic systems may not be completely free of odors, they can usually be

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described as producing a minimum of objectional odors. Aerobic composting is more rapid than anaerobic composting; also, anaerobic composting does not result in an appreciable rise in temperature, while in most aerobic composting systems the temperature exceeds the thermal tolerance of most plant and animal pathogens and parasites. Weed seeds are also destroyed.

Factors Affecting the Rate of Composting

The rate at which the material breaks down is influenced by:

(1) Availability of air.

Two composting procedures are available. Anaerobic (lack of oxygen) composting is slow but requires very little management input. Manure piled outside will compost over a period of time. The procedure will require a year or more, and the results may not be uniform. Aerobic composting requires that the material be exposed to air on a regular basis. This is accomplished by turning the material 1 to 3 times per week. Aerobic composting is much faster than anaerobic composting and may require 30 to 60 days to complete. Equipment alternatives for aerating the material include a front end loader, rototiller or mechanical aerator.

(2) Moisture level.

Composting material should be 40 to 60% moisture. The material will feel wet but not soggy. Care must be taken to not add too much water as soluble nutrients will be lost and surface and ground water contamination could occur. If properly managed, composting can be done outdoors on well drained sandy soil, on a concrete slab or on a concrete floor under a roof.

(3) Particle size.

The smaller the particle size, the more efficient the composting procedure will be. Therefore, grinding may be appropriate for some types of materials. However, more frequent aeration may be necessary for smaller particle sizes.

(4)Temperature.

Microbial metabolic activity will generate considerable heat. The center of the pile may reach 130°C to 160°C. This heat is advantageous to the rate of composting and will destroy many life forms present in the material including plant seeds, parasite larvae and eggs, and some bacteria. Heat must be controlled since low moisture materials could ignite if they are in contact with hot compost.

(5) Carbon/nitrogen ratio.

Organisms require nitrogen for multiplication. Since some bedding materials are very low in nitrogen (Table 1), additional nitrogen should be added to maximize decomposition rate. A C/N ratio of 15 to 30 will allow maximum fermentation rates. Organic nitrogen sources such as cottonseed meal grass clippings or additional manure can be added as a nitrogen source or inorganic nitrogen sources such as urea can be used.

(6) pH.

The composting of some materials may produce acids that lower the pH and stop the process. This is normally not a problem with livestock wastes, unless an unusual bedding material is used. The addition of ground limestone as a buffering agent will correct the problem.

Composting systems that are part of a horse farm or a nursery are generally considered to be an agricultural activity. If composting is a primary business, it is usually considered to be a manufacturing activity and appropriate land use regulations must be followed. Regardless of the type of operation, the site selected should minimize the possibility of ground or surface water contamination. Properly managed, a composting site should not produce fly or odor problems. However, visual impact may not be very favorable, so it should be screened from public view.

Table 1.

Table 1. Carbon to nitrogen ratios for manure and bedding materials.

Material	%N[1]	C/N ratio
Horse manure	1.0 - 2.5	17.5 - 42
Wood shavings	--	600
Wheat straw	0.53	76
Oats straw	0.60	65
Peanut hulls	0.74	54
C. Bermudagrass hay	1.10	35
Grass clippings	2.00	20
Cottonseed meal	6.60	6.2
Urea	45.00	--

[1]Dry matter basis