GARDENING SERIES
Colorado MASTER GARDENER

Using Manure in the Home Garden no. 7.742

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Outline. . .

For some gardeners in Colorado, manure is readily available as a source of organic matter to build soils and add small amounts of nutrients. However, follow precautions with manure applications or they could become more detrimental than beneficial.

E. coli: A Health Issue

Due to the potential of transmitting human pathogens, such as *E. coli*, fresh manure should not be used on fruits and vegetables. On edible crops with soil contact (like carrots, beets, potatoes) fresh manure applications should be made at least four months prior to harvest. On other edible crops, fresh manure applications should be made at least three months prior to harvest. In simple words, apply fresh manure only in the fall; but not in the spring or during the growing season. For additional details, refer to fact sheet 9.369, *Preventing E. coli from Garden to Plate*.

Nitrogen Release Rate is Slow

Manure contains small amounts of plant nutrients and micronutrients. The nutrient composition of farm manure varies widely depending on bedding material, moisture content, exposure, and aging, even for the same species of animal. Where manure is routinely added, garden soils will likely have adequate phosphorus and potassium. Manure is a great source of micronutrients like zinc. The table below gives approximate amounts of nitrogen, phosphate, and potash.

Table 1. Approximate nutrient content of manure.*

Type		N	P_2O_5	K_2O
Beef	with bedding	1.1%	0.9%	1.3%
	without bedding	1.1%	0.7%	1.2%
Dairy cattle	with bedding	0.5%	0.2%	0.5%
	without bedding	0.5%	0.2%	0.5%
Horse	with bedding	0.7%	0.2%	0.7%
Poultry	with litter	2.8%	2.3%	1.7%
	without litter	1.7%	2.4%	1.7%
Rabbit		2.0%	1.3%	1.2%
Sheep	with bedding	0.7%	0.5%	1.3%
	without bedding	0.9%	0.6%	1.3%
Swine	with bedding	0.4%	0.4%	0.4%
	without bedding	0.5%	0.5%	0.4%
Turkey	with litter	1.0%	0.8%	0.7%
	without litter	1.4%	1.0%	0.9%

*At time of land application. Sources: CSU Cooperative Extension Bulletin 552A, *Utilization of Animal Manure as Fertilizer* except for rabbits from *Western Fertilizer Handbook* of the California Fertilizer Association.

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Putting Knowledge to Work

The nitrogen in manure is not all available to growing plants the first year since much of it may be tied up in organic forms. Organic nitrogen becomes available to plants when soil microorganisms decompose organic compounds, such as proteins, and then convert the released N to NH_4. This process, known as **mineralization**, occurs over a period of years.

The amount mineralized in the first year depends upon the manure source, soil temperature, moisture, and handling. In general, about 30 percent to 50 percent of the organic nitrogen becomes available the first year. Thereafter, the amount gradually decreases. A general estimate is 50 percent the first year, 25 percent the second year, 12.5 percent the third year, and so forth. In gardens low in organic matter, it is common to find nitrogen deficiencies when the gardener relies solely on manure or compost due to the slow release rates. The gardener may need to supplement with a high N organic or manufactured fertilizer. As the soil builds in organic matter over the years, the problems with low nitrogen levels will improve.

Table 2. Approximate percentage of organic N mineralized in the first year after application.

Manure Source	Percent of organic N mineralized
Beef	35%
Dairy	35%
Horse	20%
Poultry	35%
Sheep	25%
Swine	50%

Source: Nebraska Cooperative Extension Bulleting EC89-117, *Fertilizing Crops with Animal Manures*

Salts

Salt content may be high in fresh manure and decreases with exposure to rains and irrigation as salts are leached out. Continual or heavy applications of manure can lead to a salt buildup.

To avoid salt problems associated with the use of manure or compost made with manure, limit applications to 1 inch per year (when cultivated 6 to 8 inches deep) and thoroughly cultivate the manure or compost into the soil. When cultivation is less than 6 to 8 inches deep, adjust the application rate accordingly. Have a soil test for salt content before adding large amounts.

Manure or compost made with manure containing up to 10 dS/m (10 mmhos/cm) total salt is acceptable if cultivated 6 to 8 inches deep into a low-salt garden soil (less than 1 dS/m or 1 mmhos/cm). Manure with a salt content greater than 10 dS/m (10 mmhos/cm) is questionable. Avoid use of manure on soils that are already high in salts (above 3 dS/m (3 mmhos/cm). For additional details on saline soils, refer to fact sheet 7.729, *Saline Soils*.

Note: dS/m or mmhos/cm is the units used to measure salt content. It measures the electrical conductivity of the soil.

Other Disadvantages of Farm Manure

Other disadvantages of farm manure include:

- potential burning of roots and foliage from high ammonia;
- high potential for weed seeds; and
- labor and transportation necessary to apply the manure to the garden.

Horse manure is legendary in its potential to introduce a major weed seed problem into a garden. Composting the manure before application may kill the weed seeds if the pile heats to above 145° F and the pile is turned to heat process the entire product.

Feedlot manure is often high in salts if a salt additive is used in the livestock diet.

Poultry manure is particularly high in ammonia and readily burns if overapplied. The ammonia content will be higher in fresh manure compared to aged manure. Laying hen manure can raise soil pH due to the calcium supplements in their diet.

Occasionally, gardeners may want to *fix* their soil by adding large quantities of organic matter at one time. Excessive applications of manure can lead to a reduction of plant growth due to excessive levels of nitrogen, ammonia burn, and salt damage to the roots.

Composted Manure

A growing trend in the use of manure is to compost it before application. Bagged composted manure is readily available in garden stores and nurseries. Composted manure has fewer odors. It is easier to haul and store than fresh manure because of the reduction in the weight of water and a decrease in overall volume by four to six fold. The composting process may kill weed seeds and pathogens if the pile heats above 145 degrees F, and the pile is turned to heat-process the entire product. Salts can be concentrated during composting as moisture is lost and volume is reduced. Many bagged manure products sold in Colorado are high in salts.

The nitrogen in composted manure will be primarily in stable organic forms and first year release rates will be significantly less than with fresh manure. For example, in composted dairy manure, only 5 to 20 percent of the nitrogen will be available the first year. In soils low in organic content, this can lead to a nitrogen deficiency unless an additional quick release nitrogen source is supplemented. This could be supplied with blood meal (approximately 1 to 2 pounds per 100 square feet) or with a manufactured fertilizer like ammonium nitrate (2/3 cup per 100 sq. ft) or ammonium sulfate (1 cup per 100 sq. ft.). The ammonia content drops due to volatilization during composting, thereby reducing the burn potential.

Fresh manure without bedding materials is somewhat difficult to compost, due to the high ammonia and moisture content. To speed decomposition and minimize foul odors from anaerobic decay, add some high carbon material, such as sawdust, straw, dried leaves or wood chips. Depending on climatic conditions, on-farm manure composting takes six to ten-plus weeks if turned weekly.

Colorado Master Gardener training is made possible, in part, by a grant from the Colorado Garden Show, Inc.

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