

GardenNotes #243

Using Compost in the Home Garden

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For information on home composting see CSU Cooperative Extension fact sheet #7.212, *Composting Yard Waste*.

Compost Products

Home made or commercial compost is a great source of organic matter for the garden. Compost provides a food source for beneficial soil organisms, enhancing the soil food web and releasing nutrients over the long term.

A home compost bin is an environmentally sound method to convert yard wastes into a valuable soil-building resource. Using compost has also been found to suppress some soil borne plant disease pathogens in some special situations.

Home compost has the advantage that the gardener controls what goes into the compost pile and can avoid weed seeds, diseased plants, and salt problems.

There are many bagged compost based products available in the retail trade. They could be any combination of plant residues, manure, and/or biosolids. Some products also have added rock minerals or animal by-products. These bagged products will often be three times as expensive as manure and compost supplies available in bulk. They provide a long-term release of nutrients and add organic matter to soils, improving soil physical properties.

In Colorado, compost is unregulated. Materials sold as “compost” could be anything (plant materials, manure, biosolids, animal by-products, etc.) and could be at any stage of decomposition. Not all “composts” are good for the soil.

Application Rates and Salt Problems

General application rate for compost is based on the salt content of the compost and soil and on the depth to which it is cultivated into the soil. Ideally, cultivate the compost into the top six to eight inches of the soil. On compacted/clayey soils, anything less can lead to a shallow rooting system with reduced plant growth, lower vigor, and lower stress tolerance.

The Table 1 gives standard application rate for compost. Compost made solely from plant residues (leaves and other yard wastes) is basically free of salt problems, and higher application rates are safe.

Site	Incorporation Depth ²	Depth of compost before incorporation ¹	
		Plant Base Compost and other compost known to be low in salts ³	Compost made with manure or biosolids for which the salt content is unknown ⁴
One-time application —such as lawn area	6-8"	2-3"	1"
	3-4"	1-1½"	½"
Annual application to vegetable and flower gardens – first three years	6-8"	2-3"	1"
	3-4"	1-1½"	½"
Annual application to vegetable and flower gardens – forth year and beyond	6-8"	1-2"	1"
	3-4"	1"	½"

- 1 3 cubic yards (67 bushels) covers 1,000 square feet approximately 1 inch deep.
- 2 Cultivate compost into the top 6-8 inches of the soil. On compacted/clayey soils, anything less may result in a shallow rooting depth predisposing plants to reduced growth, low vigor and low stress tolerance. The 3-4" inch depth is shown as an illustration of how application rates need to adjust when the deep cultivate is not practiced.
- 3 Plant based composted are derived solely from plant materials (leaves, grass clippings, wood chips and other yards wastes). Use this application rate also for other compost known, by soil test, to be low in salts.
- 4 Use this application rate for any compost made with manure or biosolids unless the salt content is known, by soil test, to be low. Excessive salts are common in many commercially available products sold in Colorado.

Compost, which includes manure or biosolids as a component, has a potential for high salts. Excessive salt levels are common in many commercially available products sold in Colorado. On compost made with manure or biosolids, application rate is limited unless a soil test on that batch of product shows a low salt level. An amendment with up to 10 dS/m (10 mmhos/cm) total salt is acceptable if incorporated six to eight inches deep in a low-salt garden soil (less than 1 dS/m or 1 mmhos/cm). Any amendment with a salt level above 10 dS/m (10 mmhos/cm) is questionable.

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

Compost need to be thoroughly mixed into the upper six to eight inches of the soil profile. Do not leave compost in chunks, as this will interfere with root growth and soil water movement.

As the soil organic content builds in a garden soil, the application rate should be reduced to prevent ground water contamination issues. A soil test is suggested every four to six years to establish a base line on soil organic matter content.

Nitrogen Release is Slow

Typical nutrient content includes 1.5% to 3.5% nitrogen, 0.5% to 1% phosphate, and 1% to 2% potash, plus micronutrients. Thus compost is more of a soil conditioner than a fertilizer. In gardens where compost is routinely added, phosphorus and potassium levels are likely to be adequate.

Like other organic soil amendments, the nitrogen release rate will be very slow, over a period of years. When the organic content is below 5%, additional supplemental organic or manufactured nitrogen fertilizer may be needed.

- o **5% Organic Matter** – Soils with 5% organic matter from compost will mineralize (release to plants) about 0.2 pound of nitrogen per 100 square feet per year. This should be sufficient for plant nitrogen needs.
- o **3% Organic Matter** – Soils with 3% organic matter from compost will mineralization will about 0.1 pound of nitrogen per 100 square feet per year. Additional nitrogen fertilizer will be needed for high nitrogen crops like broccoli, cauliflower, cabbage, potatoes, and corn.
- o **1% Organic Matter** – In soils with 1% organic matter or less, the release rate for nitrogen will be too low to adequately provide the nitrogen needed for crop growth. A supplemental organic or manufactured nitrogen fertilizer may be needed.

Beware of Unfinished Compost

Finished compost is dark and crumbly, does not resemble the original contents, and has an earthy smell. Compost that has not thoroughly processed could be “hot” with high ammonia content. This could burn plant roots (when applied to the soil) or plant leaves (when applied as a mulch). If the compost smells like ammonia, it should be processed longer or be worked into the soil at least one month prior to seeding or transplanting in the area.

Compost maturity can be assessed in a lab by measuring the carbon dioxide (CO₂) production by the microorganisms living in the material. Lower levels of CO₂ indicate more mature compost (i.e. microbial activity is low because they have used the available nitrogen to decompose the carbon in the compost). Conversely, if microbes are producing CO₂, they are consuming oxygen (O₂). Unfinished compost can consume all of the O₂ from the root zone and greatly inhibit root growth. Finished compost should smell earthy, like healthy soil, not like ammonia.

When making compost at home, it is advisable to turn the pile when temperatures drop below 120° F and when temperatures exceed 145° F. To encourage the active microorganism processing, moisten the pile so that it feels like a wrung-out sponge. When temperatures do not rise above 120° F after turning to reheat, compost has entered its curing stage. It should cure for 45 days before being considered finished. This curing period allows nitrogen and other chemical constituents to stabilize into forms suitable for placement around plants.

Weed Seeds and Diseased Plants

It is advisable not to compost diseased plants or weeds loaded with seeds. If the compost pile did not heat adequately or was not turned, the compost could be a source of weed seeds or plant disease pathogens. All parts of the compost should reach 145° F to kill weed seeds and plant disease pathogens. Because only the inner layers of the pile will reach this temperature, it is important that the outer layers are folded into the inner layers and the pile is allowed to reheat to 145°F. These temperatures must be maintained for at least 3 days. Temperatures of 130° F will somewhat minimize weed seeds and pathogens.

Livestock manure (horse, sheep, cow, swine, etc.) can also be a source of weed seeds in compost if the animals were fed hay with weed seeds or if seeds blew into a pile of manure.

Pet Manure

Do not add companion animal (cat, dog, etc.) feces to compost as this increases the incidence of nuisance animals rummaging through the compost pile and disease transmission to humans.

Additional Information – *CMG GardenNotes* on Soils, Fertilizers and Soil Amendments:

#211	The Living Soil	#223	Iron Chlorosis
#212	Earthworms	#224	Saline Soils
#213	Managing Soil Tilth	#231	Plant Nutrition
#214	Estimating Soil Texture	#232	Understanding Fertilizers
#215	Soil Compaction	#233	Calculating Fertilizer Rates
#216	Mulching with Wood/Bark Chips, Grass Clippings and Rock	#234	Organic Fertilizers
#217	Soil Drainage	#241	Soil Amendments
#221	Soil Tests	#242	Using Manure
#222	Soil pH	#243	Using Compost
		#244	Cover Crops and Green Manure Crops

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