

CMG GardenNotes #234

Organic Fertilizers

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Terms

By legal definition, the term *fertilizer* refers to a soil amendment that guarantees the minimum percentages of nutrients (at least the minimum percentage of nitrogen, phosphate, and potash).

An *organic fertilizer* refers to a soil amendment derived from natural sources that guarantees, at least, the minimum percentages of nitrogen, phosphate, and potash. Examples include plant and animal by-products, rock powders, seaweed, inoculants, and conditioners. These are often available at garden centers and through horticultural supply companies.

These should not be confused with substances approved for use with the *USDA National Organic Program (NOP)*. The USDA NOP, with its “USDA Organic” label, allows for the use of only certain substances. The Organic Materials Review Institute (OMRI at www.omri.org) approves brand name products made with ingredients from the “National List” for use with the NOP. (For details refer to www.ams.usda.gov/nop and click “NOP Regulations” and then “National List

Information”). Many of the organic fertilizers listed here will meet NOP standards (based on the National List). Growers participating in the NOP should consult with their certifier to ensure compliance for organic certification.

The terms *soil amendment* refers to any material mixed into a soil. *Mulch* refers to a material placed on the soil surface. By legal definition, soil amendments make no legal claims about nutrient content or other helpful (or harmful) affects it will have on the soil and plant growth. In Colorado, the term *compost* is also unregulated, and could refer to any soil amendment regardless of active microorganism activity.

Many gardeners apply *organic soil amendments*, such as compost or manure, which most often do not meet the legal requirements as a “fertilizer” but add small amounts of nutrients.

Notes:

Release Time – Organic products require the activity of soil microorganisms before nutrients are available for plant uptake. Microorganism activity is generally dependant on soil temperatures greater than 50⁰ F in the presence of sufficient soil moisture. Dry and/or cold soil conditions will delay the release of nutrients from these organic sources. This period refers to how long these products are available if applied to the soil. Use this information to time the application of the product.

Application – Different products may be applied in various ways. Some may be tilled in (worked into the soil with a machine or hand tool), others may be applied as a foliar spray (mixed with a surfactant and sprayed in a fine mist on the leaf surface while temperatures are below 80° F), and some may be injected into a drip or overhead irrigation system (fertigation with a siphon mixer). Application rates in this fact sheet are generalized and based on some manufacturers’ recommendations. Over- or under-fertilization may occur using these recommendations.

Plant by-products

Alfalfa meal or pellets

Alfalfa meal or pellets are often used as animal feed. Primarily they are used to increase organic matter in the soil but do offer nutrients and a high availability of trace minerals. They contain trianconatol, a natural fatty-acid growth stimulant.

Alfalfa meal or pellets

Typical NPK analysis	2-1-2
Release time	1-4 months
Pros	Available at feed stores
Cons	May contain seeds
Application	Till in 2-5 pounds per 100 square feet

Corn gluten meal

Corn gluten meal materials have a high percentage of nitrogen. It carries a warning to allow 1 to 4 months of decomposition in the soil prior to seeding. Allelopathic properties will inhibit the germination of seeds. However, there is no danger to established or transplanted plants. This product is also marketed as a pre-emergent weed control for annual grasses in bluegrass lawns.

Corn gluten meal

Typical NPK analysis	9-0-0
Release time	1-4 months
Pros	Very high nitrogen
Cons	Germination inhibitor, some are GMOs
Application	Till in 20-40 pounds per 1000 square feet

Cottonseed meal

Cottonseed meal is a rich source of nitrogen. Buyers should be aware that many pesticides are applied to cotton crops and residues tend to remain in the seeds. Pesticide-free cottonseed meal is available.

Cottonseed meal

Typical NPK analysis	6-0.4-1.5
Release time	1-4 months
Pros	High nitrogen
Cons	Pesticide residues, most are GMOs
Application	Till in 10 pounds per 100 square feet

Soybean Meal

Used primarily as an animal feed product. Available bagged at many feed stores.

Soybean meal

Typical NPK analysis	7-2-1
Release time	1-4 months
Pros	High nitrogen, available at feed stores
Cons	Almost half of the conventionally grown soy is GMO
Application	8 pounds per 100 square feet

Animal by-products

Bat guano – high N

Bat guano (feces) harvested from caves is powdered. It can be applied directly to the soil or made into a tea and applied as a foliar spray or injected into an irrigation system.

Bat guano – high N

Typical NPK analysis	10-3-1
Release time	4+ months
Pros	Stimulates soil microbes
Cons	Cost
Application	Till in 5 pounds per 100 square feet or as a tea at 3 teaspoons per gallon of water

Bat guano – high P

See the description above. Difference is that it is processed for high phosphorus content.

Bat guano – high P

Typical NPK analysis	3-10-1
Release time	4+ months
Pros	Stimulates soil microbes
Cons	Cost
Application	Till in 5 pounds per 100 square feet or as tea at 3 teaspoons per gallon of water

Blood meal

Blood meal, made from dried slaughterhouse waste, is one of the highest non-synthetic sources of nitrogen. If over-applied it can burn plants with excessive ammonia.

Blood meal

Typical NPK analysis	12-0-0
Release time	1–4 months
Pros	Available at feed stores
Cons	Can burn. Expensive at garden centers
Application	Till in 5–10 pounds per 100 square feet

Bone meal

A well-known source of phosphorus, bone meal is steam processed and widely available at feed stores and in garden centers. If purchased at feed stores, P is expressed on the label as elemental phosphorus and is 2.3 times higher than numbers shown on garden center labels for phosphate (i.e. – 12% phosphate is the same as 27% phosphorus). **However, recent CSU research has shown that P from bone meal is only available to plants in soils that have a pH below 7.0.**

Bone meal

Typical NPK analysis	3-15-0
Release time	1–4 months
Pros	Highly plant available form of phosphorus
Cons	Cost
Application	Till in 10 pounds per 100 square feet

Feather meal

Sourced from poultry slaughter, feather meal has fairly high nitrogen levels but is slow to release the N.

Feather meal

Typical NPK analysis	N varies 7 – 12% on process
Release time	4+ months
Pros	Long term fertilizer
Cons	Cost versus speed of N release
Application	Till in 2.5-5 pounds per 100 square feet

Fish emulsion

Infamous for its foul smell, emulsions are soluble, liquid fertilizers that have been heat and acid processed from fish waste.

Fish emulsion

Typical NPK analysis	5-2-2
Release time	1 – 4 months
Pros	Adds needed micronutrients
Cons	Some have foul smell
Application	Mix 6 tablespoons per gallon of water

Enzymatically digested hydrolyzed liquid fish

Enzymatically digested hydrolyzed liquid fish may be using enzymes to digest the nutrients from fish wastes instead of using heat and acids. This retains more of the proteins, enzymes, vitamins and micronutrients than emulsions.

Enzymatically digested hydrolyzed liquid fish

Typical NPK analysis	4-2-2
Release time	1 – 4 months
Pros	More nutrients than emulsions
Cons	More expensive than emulsions
Application	Mix 5 tablespoons per gallon of water

Fish meal

Fish meal is ground and heat dried fish waste.

Fish meal

Typical NPK analysis	10-6-2
Release time	1 – 4 months
Pros	N and P source
Cons	Heat processed
Application	Till in 5-10 pounds per 100 square feet

Fish powder

Fish powder is dried with heat and turned into water-soluble powder. It is a high source of nitrogen. Many can be mixed into solution and injected into an irrigation system.

Fish powder

Typical NPK analysis	12-0.25-1
Release time	Immediate to 1 month
Pros	Adds micro-nutrients
Cons	Heat processed
Application	Till in 1-2 oz. Per 100 square feet OR Mix at 1 tablespoon per gallon of water

Compost, manure, and biosolid based products

For information on biosolids, worm casting, manure, and compost, refer to the following CMG GardenNotes:

- #241, Soil Amendments
- #242, Using Manure in the Home Garden
- #243, Using Compost in the Home Garden

Rock powders

Rock powders relevant for use in Colorado soils are those that supply phosphorus. Those that serve as a potassium source (greensand, feldspar, potassium sulfate, biotite, etc.) are not necessary as Colorado soils are naturally high in potassium. Similarly, it is not necessary to add calcium (gypsum, lime, etc.) due to naturally high calcium levels in Colorado soils and arid conditions.

If you are making annual applications of manure and/or compost to your garden to add nitrogen, you should have sufficient levels of phosphorus in your soil. If you are applying manure or compost to your garden based on P needs, you might have an excess N supply. Excess N can lead to poor flower/fruit development and increases water pollution potential from N leaching from the soil.

Generally, plant or animal sources are the best value for phosphorus in the home garden. **Recent CSU research results concluded that no rock P (regardless of mesh size) is available for plant use unless the soil pH is below 7.0.**

Colloidal phosphate – a.k.a. soft rock phosphate

This product is made by surrounding clay particles with natural phosphate. Total phosphate is about 20% while available phosphate is about 2-3%. This is why you can apply large amounts of colloidal phosphate, as it will release slowly over the years (usually more available the second year than the first). For home gardeners the cost/return is adequate to apply colloidal phosphate at rates to supply phosphorus for this season's crops. This product also adds micronutrients to soil.

Micronized (passing through 1000 mesh screen [1000 wires per square inch]) sources may be more available than regular soft rock grinds in soils with a pH below 7.0.

Seaweed

Kelp is the most common form and is valued not for its macronutrient (N, P, and K) contributions but for micronutrients, trace minerals, amino acids and vitamins plus growth hormones that stimulate plant cell division.

Kelp is often mixed with fish products to enhance growth.

Three processes are available: extracts (as kelp meal or powder), cold-processed (usually liquid) and enzymatically digested (liquid). Ranked in quality of content and plant availability they are (highest to lowest) 1) enzymatically digested, 2) cold-processed and 3) extracts.

Kelp meal

Kelp meal, a product of the ocean, is used primarily as a trace mineral source. It is often combined with fish meal to add N-P-K value.

Kelp meal

Typical NPK analysis	negligible
Release time	4+ months
Pros	Adds micronutrients
Cons	Insignificant NPK value
Application	Till in 1 pound per 100 square feet

Kelp powder

Kelp powder is similar to kelp meal but ground fine enough to put into solution and applied as a foliar spray or injected into an irrigation system.

Kelp powder

Typical NPK analysis	1-0-4
Release time	Immediate – 1 month
Pros	Adds micronutrients
Cons	Insignificant NPK value
Application	Mix ¼ to ½ teaspoon/gallon of water

Liquid kelp

Usually cold processed, liquid kelp will have higher levels of growth hormones than extracts. Some may also be enzymatically digested, making the growth hormones even more available to the plants.

Liquid kelp

Typical NPK analysis	Negligible
Release time	Immediate – 1 month
Pros	Adds micronutrients plus helps plant with stress
Cons	Insignificant NPK value
Application	Mix 1 – 2 TBS/gal of water for foliar or Mix at ¼ - 1¼ tsp/gal/100 ft ² and inject into an irrigation system

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

#211	Introduction to Soils	#231	Plant Nutrition
#212	The Living Soil	#232	Understanding Fertilizers
#213	Managing Soil Tilt	#233	Calculating Fertilizer Rates
#214	Estimating Soil Texture	#234	Organic Fertilizers
#215	Soil Compaction	#241	Soil Amendments
#218	Earthworms	#242	Using Manure
#219	Soil Drainage	# 243	Using Compost
#221	Soil Test	#244	Cover Crops and Green Manure Crops
#222	Soil pH	#245	Mulching with Wood/Bark Chips, Grass Clippings and Rock
#223	Iron Chlorosis		
#224	Saline Soils	#251	Asking Effective Questions About Soils

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