



## CMG GardenNotes #234

# Organic Fertilizers

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**Outline:** Terms, page 1  
Plant By-Products, page 2  
Animal By-Products, page 3  
Rock Dust or Powders, page 5  
Seaweeds, page 5

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### Terms

The term **soil amendment** refers to any material mixed into a soil to improve soil properties.

**Mulch** refers to a material placed on the soil surface and is, therefore, not a soil amendment.

**Fertilizer** refers to a product that contains at least one essential available plant nutrient.

An **organic fertilizer** refers to a product derived from natural sources that contains at least one essential available plant nutrient. Examples include plant and animal by-products, rock powders, and seaweed. Organic fertilizers are often available at garden centers and through horticultural supply companies. Nutrients in organic fertilizers are often in a form inaccessible to plant uptake and need to be converted by soil microorganisms into bioavailable forms before plants can uptake these nutrients. As a result, organic fertilizers often result in the slower release of nutrients, compared to inorganic (or synthetic) fertilizers, and can also improve soil properties through the addition of organic matter.

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, <https://www.omri.org>, and the Washington Department of Agriculture (WSDA), <https://agr.wa.gov>, review and approve brand name products made with ingredients from the “national list” for use in certified organic production. If a fertilizer is not OMRI or WSDA approved, it may still be allowed for organic production but has not been reviewed and deemed suitable for use in certified production. To learn more about which inputs are allowed and which are prohibited, refer to <https://www.ams.usda.gov/rules-regulations/national-list-allowed-and-prohibited-substances>. 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.

Many gardeners apply *organic soil amendments*, such as **compost** or manure, which typically do not meet the legal requirements as a “fertilizer” but adds small amounts of nutrients. The term **compost** refers to organic matter that has been biologically degraded. While Colorado requires that commercial compost be sufficiently composted to reduce pathogens and vector transfer (C:N ratio must be 18:1 or less), there is no standard regarding the compost’s state of decomposition.

Two important terms related to the use of all soil amendments are the release time and the application of the product:

- **Release Time** – Organic products require the activity of soil microorganisms before nutrients are available for plant uptake. Microorganism activity is dependent on soil temperatures greater than 50°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** – 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.

Before applying a fertilizer, conduct a soil test to determine what deficiencies your soil might have.

## Plant By-Products

### Alfalfa Meal or Pellets

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

#### Alfalfa Meal or Pellets

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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

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### Corn Gluten Meal

Corn gluten meal has a high percentage of nitrogen. Products carry a warning to allow one to four 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

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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

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### 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

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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

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#### Soybean Meal

Soybean meal is used primarily as an animal feed product. It is available bagged at many feed stores. Soybean meal may inhibit the germination of seeds, so it should be applied several weeks before planting.

#### Soybean Meal

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Typical NPK analysis	7-2-1
Release time	1-4 months
Pros	High nitrogen, available at feed stores
Cons	Almost ½ the conventionally grown soy is GMO
Application	8 pounds per 100 square feet

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### Animal By-Products

#### Bat Guano

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 can have a high nitrogen content, or it can also be processed for high phosphorus content.

#### Bat Guano – High N

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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

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#### Bat Guano – High P

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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 a tea at 3 teaspoons per gallon of water

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#### 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 due to excessive ammonia.

#### Blood Meal

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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

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## 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, phosphorus 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 phosphorus from bone meal is only available to plants in soils that have a pH below 7.0.**

### Bone Meal

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

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## Feather Meal

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

### Feather Meal

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

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## Fish Emulsion

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

### Fish Emulsion

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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

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## Enzymatically Digested Hydrolyzed Liquid Fish

Enzymatically digested hydrolyzed liquid fish products use 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

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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

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## **Fish Meal**

Fish meal is ground and heat dried fish waste.

### **Fish Meal**

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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

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## **Fish Powder**

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

### **Fish Powder**

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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 ounces per 100 square feet OR mix at 1 tablespoon per gallon of water

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## **Rock Dust or Rock Powders**

Rock dust or rock powders are made of finely crushed rock and can be used to supply the soil with certain minerals. A common example of rock dust is gypsum or lime, which is used as a source of calcium. Gypsum and lime are typically not needed in Colorado due to the naturally high calcium levels of many of our soils.

Rock powders that serve as a potassium source (greensand, feldspar, potassium sulfate, biotite, etc.) are typically not necessary here either, as many Colorado soils are naturally high in potassium.

For phosphorus deficiencies, home gardeners can use colloidal phosphate. Colloidal phosphate releases a small and steady supply of available phosphate (2-3%) and other micronutrients over several years. However, CSU research concluded that no rock phosphorus, regardless of mesh size, is available for plant use unless the soil pH is below 7.0. As a result, most Colorado gardeners will benefit from using plant or animal sources of phosphorus rather than rock phosphorus. 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.

## **Seaweeds**

Kelp is the most common form and is valued not for its macronutrient (nitrogen, phosphorus, and potassium) contributions but for its micronutrients.

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).

In regard to quality of content and plant availability, they are ranked (highest to lowest) as 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 nitrogen, phosphorus, and potassium.

### Kelp Meal

Typical NPK analysis	Negligible
Release time	4+ months
Pros	Adds micro-nutrients
Cons	Insignificant nitrogen, phosphorus, potassium
Application	Till in 1 pound per 100 square feet

## Kelp Powder

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

### Kelp Powder

Typical NPK analysis	1-0-4
Release time	Immediate to 1 month
Pros	Adds micronutrients
Cons	Insignificant nitrogen, phosphorus, potassium
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 to 1 month
Pros	Adds micronutrients plus helps plants with stress
Cons	Insignificant nitrogen, phosphorus, potassium
Application	Mix 1-2 Tablespoons per gallon of water

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