

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 (www.omri.org) and the Washington Department of Agriculture (WSDA) (<http://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 <http://www.ams.usda.gov/about-ams/programs-offices/national-organic-program>. 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 term *soil amendment* refers to any material mixed into a soil. *Mulch* refers to a material placed on the soil surface. In Colorado, soil amendments have no legal claims about nutrient content or other helpful (or harmful) effects 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 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.

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 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 has a high percentage of nitrogen. Products carry 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

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. 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, 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

| | |
|----------------------|---|
| 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 nitrogen.

Feather Meal

| | |
|----------------------|--|
| 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 |

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 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

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

Compost, Manure, and Biosolid Based Products

For information on biosolids, worm castings, 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.

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%. 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 (nitrogen, phosphorus and potassium) contributions but for 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). 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 nitrogen, phosphorus and potassium.

Kelp Meal

| | |
|----------------------|--|
| Typical NPK analysis | negligible |
| Release time | 4+ months |
| Pros | Adds micronutrients |
| Cons | Insignificant nitrogen, phosphorus and potassium |
| 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 nitrogen, phosphorus and 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 – 1 month |
| Pros | Adds micronutrients plus helps plant with stress |
| Cons | Insignificant nitrogen, phosphorus and potassium |
| Application | Mix 1-2 tablespoons per gallon of water |

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

| | | | |
|------|-------------------------|------|---|
| #211 | Introduction to Soils | #232 | Understanding Fertilizers |
| #212 | The Living Soil | #233 | Calculating Fertilizer Rates |
| #213 | Managing Soil Tilt | #234 | Organic Fertilizers |
| #214 | Estimating Soil Texture | #241 | Soil Amendments |
| #215 | Soil Compaction | #242 | Using Manure |
| #218 | Earthworms | #243 | Using Compost |
| #219 | Soil Drainage | #244 | Cover Crops and Green Manure Crops |
| #221 | Soil Test | #245 | Mulching with Wood/Bark Chips, Grass Clippings and Rock |
| #222 | Soil pH | #246 | Making Compost |
| #223 | Iron Chlorosis | #251 | Asking Effective Questions About Soils |
| #224 | Saline Soils | | |
| #231 | Plant Nutrition | | |

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