



Amending the Soil in Kansas City Gardens

Compare these two sets soil test results. No nitrogen, phosphorus or potassium was added between the tests and the garden was heavily planted throughout the three-year period. Compost was added to the soil surface spring and fall.

Element	2003	2006
PH	neutral	neutral
Phosphorus & potassium	very high	very high
Calcium & magnesium	high	high
Organic matter	10.2%	14.4%

The soil tests are the same after three years without supplemental fertilizer. How does this magic happen?

Gardens in most places need a balanced fertilizer with equal parts nitrogen, phosphorus and potassium, the N, P, and K on fertilizer labels. A 10/10/10, for example, is a balanced fertilizer. In the Kansas City area, however, most soils need only nitrogen (N) because our native soils are naturally rich in phosphorus and potassium as well as calcium and magnesium. If you have used a balanced, 10/10/10-type fertilizer for several years, your yard is probably very high in phosphorus and potassium and you need to add only nitrogen.

Amending for *fertility* in Kansas City soils

Nitrogen (N) – Add it in the early spring and periodically throughout the growing season. Nitrogen does not hang around for very long. Choose a nitrogen-dominant formulation like fish emulsion (4-2-2), corn gluten (9-0-0), soybean meal or cottonseed meal (7-2-2). Use organic sources of nitrogen to nurture soil microorganisms that create nitrogen and help plants absorb other nutrients.

Phosphorus (P) – Your soil probably already has plenty; get a soil test to be sure. Kansas City soils contain plenty of phosphorus and your garden uses it slowly. Avoid phosphorus-dominant products such as 5-10-5 or, worse yet “bloom buster” 10-30-20. Excessive phosphorus decreases microbial life in the soil and can contribute to chlorosis (yellow leaves with green veins) by suppressing iron and manganese uptake. Claims that high phosphorus fertilizers stimulate rooting and increase blooms are not supported by research.

Potassium (K) – Get a soil test before amending with potassium. Kansas City soils have plenty and your garden uses it slowly.

Formulation – Liquid for a quick shot of nutrients
Granular for cost effectiveness
Slow release for ease of application

Amending for *PH* in Kansas City soils

PH measures the relative acidity or alkalinity of the soil. A plant's ability to uptake nutrients in the soil is maximized when the PH is in the range of 6.0 to 7.0. Kansas City soils are generally neutral to slightly alkaline, above 7.0.

PH of greater than 7.0 = alkaline soil

PH of 7.0 = neutral soil

PH of less than 7.0 = acid soil

Sulfur –To grow azaleas, rhododendrons, blueberries or to make your mop-head hydrangeas blue, you can to make your soil more acid (opposite of alkaline) by adding sulfur. Sulfur acts slowly to acidify the soil but remains in the soil longer than other amendments. Iron sulfate and aluminum sulfate act faster to acidify soils than sulfur, but excessive application of aluminum sulfate can be toxic to plants.

Lime – Use lime to make soil more alkaline. It's very unlikely that you'll need to add lime to Kansas City since our soils are naturally alkaline. Do not add lime without a soil test that indicates your soil is too acidic.

Chelates – In alkaline soils (7.0 or higher PH) plants may be unable to uptake nutrients, even when nutrients are present in the soil. However, in alkaline soils, plants can uptake chelates of those nutrients. If plants are showing signs of iron chlorosis (yellow leaves with green veins), apply chelated-iron as a foliar spray or soil amendment to assure that acid loving plants can uptake iron. Chelates don't persist in the soil for very long. You may need to apply them several times a season.

Amending for soil *structure* in Kansas City soils

Nutrient-rich clay is the dominant soil type in Kansas City residential areas. Our soil holds onto water and is slow to dry out. If worked when wet, it loses the air spaces required for healthy roots. Add the following amendments to improve drainage and space for air.

Composted organic matter – Layer compost on top of the soil, or scratch into soil surface. Do this on an annual basis unless your soil test indicates 10% or more organic matter. Five percent organic matter is considered sufficient, but organic matter breaks down rapidly and must be replenished annually. Add organic matter to the surface of the soil—like nature does. You don't need to till it in to gain its benefits. Tilling, in fact, unnecessarily harms soil structure.

What are the benefits of adding composted organic matter?

- Makes clay soils less dense by creating air spaces for roots
- Supports microorganisms that make nutrients available
- Improves drainage

When and how to add composted organic matter?

New beds – Add 6 to 8 inches of compost over 4 to 5 sheets of wet newspaper

Existing beds, trees and shrubs – 1 to 3 inch top dressing, spring and fall

Lawns – Combine 1 inch top dressing of compost with core aeration

Mulch – After you've amended for nutrients and texture, cover bare ground with an organic mulch to preserve your improvements. A cover of mulch (wood chips, shredded leaves, straw) slows the evaporation of moisture and the leaching of nutrients into the air and keeps rain from re-compacting the soil. A cover of organic mulch also creates a soil habitat more favorable to soil microorganisms.

An Amendment to *harm* your soil?

Sand – In most cases, adding sand to clay soil makes drainage and soil structure worse. Adding a small amount of sand to clay soil produces soil structure that resembles concrete. You must add 75% or more sand by volume to clay to improve drainage.

What soil amendments may be useful in other soils, but not in Kansas City soils?

Gypsum (calcium sulfate) is sold as an agent to prevent soil crusting and improve structure in soils high in sodium, which Kansas City soils are not. Gypsum can be helpful in Kansas City, however, to supply calcium to container grown tomatoes, heavy feeders of calcium.

Epsom salts (a salt of magnesium and sulfur) is often sold as a source of magnesium, a nutrient already plentiful in Kansas City soils. Sulfur can be used to raise soil acidity, but the sulfur in Epsom salts is not in a form that will acidify soils.

Micronutrient mixes are sold as a source of elements beyond nitrogen (N), phosphorus (P) and potassium (K). The micronutrients that plants need are boron, calcium, carbon, chlorine, copper, hydrogen, iron, magnesium, manganese, molybdenum, oxygen, sulfur and zinc. You are probably wasting your money to apply these mixes because Kansas City's clay soils are already rich in these micronutrients. Better ways to spend your money: (1) Maintain soil PH between 6.0 and 7.0, the best range for nutrient uptake. (2) Regularly add composted organic matter.

Hydrogels are sold to improve water retention. Kansas City's clay soils do not need more water holding ability; they already do this too well. In containers, hydrogels will increase water retention, but research does not show that it makes more water available to plant roots. Research shows that composted organic matter both improves water retention, and makes that water available to plant roots. So increase the water available in your containers by adding composted organic matter instead of hydrogels.

Humic acid has chelating properties that can make iron more available to plants in alkaline soils. However, adding chelated iron works better. Research also indicates that

humic acid helps for plants under stress, but shows no improvement for plants not under stress.

Mycorrhizae are fungi that are beneficial to nutrient uptake and disease resistance. There is no doubt that naturally occurring mycorrhizae are useful, but to be effective, commercial fungi must be matched to the type of plant. A better approach is to make your own compost and add it regularly to your beds. This assures a supply of naturally occurring mycorrhizae in your garden.

Compost tea and seaweed extracts are recommended for their general elixir characteristics. Research has yet to demonstrate benefits.

The best and easiest way to prepare a new planting bed. This method is healthier for your soil and easier on your back.

1. Cover the entire area with 4 to 5 thicknesses of wet newspaper. No need to kill or remove sod or weeds; they will die and return organic matter to the soil.
2. Cover the newspaper with a mix of soil and compost.
 - a. Cover 6" deep if the area is over tree roots.
 - b. Cover 8" deep if the area is well away from tree roots.
3. Let the area rest from fall until the following spring.
4. Plant right into the new soil/compost mix.

Where to go for more information?

Linda Chalker-Scott, [The Informed Gardener](#)

Jeff Gillman, [The Truth about Garden Remedies](#) and [The Truth about Organic Gardening](#)

www.mggkc.org (Master Gardeners of Greater Kansas City)

www.extension.missouri.edu/explore/agguides/hort/ (University of MO Extension)

www.oznet.ksu.edu (Kansas State Univ. Extension)

816-833-8733 Hotline, Master Gardeners of Greater Kansas City

913-715-7050 Hotline, Extension Master Gardeners, Johnson County, KS

Take your soil to be tested:

Johnson County K-State Research and Extension

11811 S. Sunset Dr. Suite 1500

Olathe, KS 66061-7507

<http://www.johnson.ksu.edu/p.aspx?tabid=120>

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