



GROWING YOUR GARDEN

Amending soil and plant nutrients: Garden guide

Soil Amendments

How do you maintain a quality soil in your garden, or make your garden's soil even better? Amend it! Soil amending is the process of adding material to the soil to make it a better habitat for plants. Soils can be amended to increase nutrients or to improve the structure of the soil. Compost will typically achieve both desired outcomes. Without amending your soil, your plants will use up the available nutrients in the soil over time. With fewer available nutrients, your plants will not grow as well and may even die. Bottom line, amending the soil is important. Here's how it's done.

Timing

The best time to amend your soil will be right before planting or right after harvesting. Plants pull their nutrients from the soil as they grow, so you will need to add those nutrients back into the soil before or after growing more food. If you do need to add or replace nutrients to your soil while your garden is full of plants, you can 'top dress' a garden with compost by spreading it across the surface of the soil and working it into the top inch so as not to disturb the roots. You can also look to other methods of fertilizing your garden.



Purchasing Soil Amendments

When purchasing soil amendments for your Learning Garden, it is important to only purchase products that will be safe in a hands-on, school garden setting. Be sure to look for the OMRI certification (Organic Materials Review Institute) to be sure that the product you are adding is made from safe products. Safety concerns are also managed by following directions on a product label because even products considered 'safe' can be harmful at high concentrations.

Compost

Compost is the final product of the process of decomposition. Decomposition breaks down plants to their base elements making each available to be absorbed by new plants. **Compost increases the amount of water that soil holds, improves soil structure, adds beneficial microorganisms to the soil, and contains nutrients plants need to grow.**

Spread compost about 1" thick across the surface of your soil before or after a growing season. Use a shovel to turn and mix that compost into the top 6-12 inches of your soil. The goal is to evenly mix compost into your soil so as to make it directly available to your plants roots. Expect to do this once per growing season.

Other considerations

Soils are living, biological systems composed of many different types of organisms, and most are beneficial. If your garden still seems to be struggling even after you have amended it, it may be that you need to improve the living components of your soil. Things like worms and mycorrhizal fungi can help your plants grow better and improve the efficiency of your soil amendments. Over time, compost may not meet all the nutrient needs of your garden. If you think your soil is still lacking in nutrients, ask a Garden Educator to help recommend how you can test your soil for nutrient levels.

Plant Nutrients

So you have been composting and mulching and doing everything else to take care of your garden, but for some reason your plants just are not growing as well as they used to. One possibility is that your garden is struggling with a soil nutrient deficiency.

Just like humans, plants need certain nutrients to live. And just like us, if plants don't get enough of these nutrients, their health suffers. There are over 100 naturally occurring chemical elements -plants require only 17 of them to survive. These elements are: carbon (C), hydrogen (H), oxygen (O), nitrogen (N), phosphorus (P), potassium (K), sulfur (S), calcium (Ca), iron (Fe), magnesium (Mg), boron (B), Manganese (Mn), copper (Cu), zinc (Zn), chlorine (Cl), molybdenum (Mo) and nickel (Ni).

TEACHING TIP

There is a mnemonic device using the elemental symbols to help both you and your students memorize the 17 nutrients. The device is:

C.HOPKNS CaFe Mg B Mn CuZn Cl Mo Ni

or

"C.Hopkins cafe managed by mine cousins Clyde, Moe and Nicki."

Of these 17 nutrients, only carbon, hydrogen and oxygen are not taken up from the soil, but are absorbed from air and water. The remaining 14 nutrients are divided into primary, secondary and micronutrients based on how much of the nutrient is required by plants.

Primary Nutrients

Nitrogen (N): Nitrogen is the nutrient most associated with green plant growth. Nitrogen is used by plants to create amino acids, which then form proteins that are used to help build cells, enzymes, and chlorophyll. Nitrogen deficiencies result in slow or stunted growth, yellowing of the leaves, and the death of leaf tips/margins beginning with older growth.

Phosphorus (P): Phosphorus is primarily used in the creation of DNA and RNA and is a part of the energy creation process. Phosphorus is also associated with seedling development and root formation. Deficiencies in phosphorus result in slow/stunted growth, purpling of the leaves of some plants, dark green coloration, slowed maturity, and poor fruit/seed development.

Potassium (K): Potassium is the primary nutrient associated with fruit and vegetable quality. It also plays a role in protecting the plant from disease as well winter hardiness. Symptoms of potassium deficiencies include slow growth, small fruits and seeds, weak stems/stalks, and yellowing/death of leaf margins.

As the Primary nutrients are needed in relatively large quantities, whole industries have grown up around providing these nutrients. In fact, any product sold as fertilizer to the general public has to have the amount of plant available N-P-K or Nitrogen, Phosphate (P₂O₅), and Potassium (K₂O, also known as Potash) in that order on the label. So, for example, if an organic fertilizer rating is a 5-7-3, it is composed of 5% Nitrogen, 7% Phosphate, and 3% Potash. This labeling system will help you find the right amendment for your garden.



Secondary Nutrients

Secondary nutrients are slightly harder to come by than primary nutrients. Calcium is found in sources like fish meal and sea shells. Lime, the stone not the fruit, is also a great source of calcium, and has some magnesium to boot. If applying lime, nine times out of ten, you are going to want calcitic instead of dolomite lime as dolomite lime is too high in magnesium which can actually result in calcium deficiencies. Sulfur is very rarely found on its own and if your plants are deficient in sulfur you will need to find an organic fertilizer that includes sulfur in the formula.

Sulfur (S): Sulfur is used in the creation of amino acids and protein synthesis. As far as quantity of nutrient needed, sulfur falls just below the three major nutrients and is considered by some to be the "fourth major nutrient". Sulfur deficiencies are characterized by slowed growth, yellowing of the younger leaves and spindly plants.

Calcium (Ca): Calcium is used in plants to build cell walls and membranes in much the same way as calcium is used in our bodies to build bones. Calcium deficiencies are characterized by the death of growing points (shoots/root tips), premature shedding of blossoms and foliage, weakened stems and tip burn.

Magnesium (Mg): Magnesium helps make up chlorophyll and is therefore necessary for photosynthesis. It also activates several growth enzymes within the plant. Magnesium deficiencies are characterized by yellowing in between the veins of older leaves and curling of leaves along the edges.

Micronutrients

The remaining nutrients - iron, boron, manganese, copper, zinc, chlorine, molybdenum, and nickel - are all classified as micronutrients. Micronutrients are required by plants in such small quantities that the soil levels are very rarely deficient. The only one that you are ever likely to lack in your garden is iron. For iron, your best bet, like sulfur, is to find an organic fertilizer that has iron in it. If you find yourself in a situation where your garden appears to be deficient in a micronutrient, please contact your Garden Educator! Most micronutrients become toxic to plants in large quantities and you can unintentionally kill your garden if you are not careful.

