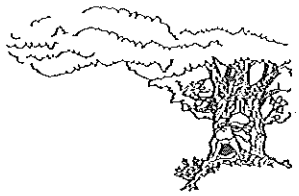

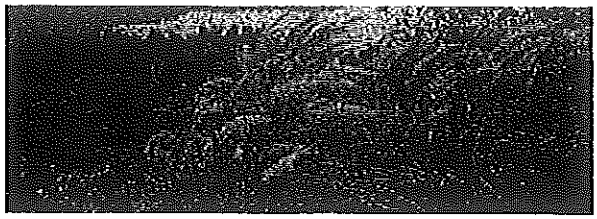

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Soil: The Key to Successful Gardening

by J.R. Feucht [1]

Quick Facts...

- Organic matter is best used as an amendment rather than a source of fertilizer.
- First determine whether the problem in growing healthy plants is nutrition or a physical property of the soil.
- The best soils for growing plants are uniform in texture throughout the root zone and have a good balance of minerals, air and organic matter.
- If a soil is too sandy or high in clay, the solution to both extremes is essentially the same: add organic matter.

Interest in organic Gardening has been successful largely because the practice encourages the use of organic matter as an **amendment**, thereby improving soil texture (tilth). This, in turn, improves the environment for good root growth and the development of soil microorganisms that make nutrients more readily available.

Organic matter also supplies some nutrients, but most forms of organic matter are rather low in amounts when compared with the commercial inorganic sources. From the standpoint of plant use, it makes no difference whether the nutrients are supplied from organic or inorganic sources since the plants can only use the nutrients in the basic inorganic form. The difference is primarily in the availability. For instance, nitrogen from organic sources is released more slowly than from most commercial fertilizers.

Slow release of nutrients would be desirable in a soil already adequate in nutritional levels. On the other hand, where soils are deficient in one or more nutrients, it usually is desirable to add commercial, more quickly available fertilizers to correct the deficiency.

Before adding fertilizers to a soil, first determine whether a problem in growing healthy plants is due to **nutrition** or a **physical** property of the soil, such as poor texture. A plant in a "tight," poorly aerated soil may do poorly because the root system is unable to utilize

the nutrients, even though they may be present in adequate amounts. Amendment with organic matter to "open up" the soil first is more appropriate in this case than adding a commercial fertilizer.

Soil Texture and Drainage

Soil with a steep slope, while having good **surface** run-off (often confused with good drainage), may have poor **subsurface** drainage if the texture is fine (high in clay) or if underlying soils create a barrier to water movement. Water is always held more tightly in fine soils than in coarse, sandy soils. A fine-textured soil underlaid with buried organic matter, sand and even gravel will not drain well. The water will not move through the coarse layer because it is held more tightly in the finer-textured soil above. The best soils for growing plants are uniform in texture throughout the root zone with a good balance of minerals, air and organic matter.

Texture Test: Roll some **slightly** moistened soil between your thumb and forefinger. If it forms a firm ball, feels smooth and becomes sticky when moistened, it is too high in clay. If you cannot form a ball, the soil won't stay together and it feels somewhat grainy, the soil will be of a better texture. If, on the other hand, the soil feels very coarse, it may be too sandy and will not hold an adequate amount of water.

Subsoil Drainage Test: Dig a hole in the Garden area about 12 inches deep and the diameter of a spade. Pour water in the hole to the rim. Refill the hole a day later and observe how long it takes for **all** the water to soak in. If the water soaks in within a few minutes, the subsoil drainage may be **too good**. Such soils may not hold enough water to sustain plant life and can loose valuable nutrients through leaching. If the water takes more than one hour to soak in, the subsoil drainage may be poor. Plants may suffer from oxygen starvation (drowning) under these conditions.

Soil Amendments

Soil improvement is a continual process. It often takes 10 or more years to make a productive Garden soil. If your soil is too sandy or too high in clay, the solution to both extremes is essentially the same -- add organic matter. In a sandy soil, organic matter acts much like a sponge to hold moisture and nutrients. In clay, organic matter helps to aggregate the finer particles allowing for larger pore spaces, thus improving aeration and drainage.

It is possible, especially in clay soils, to create a **soluble salt** problem by adding too much organic matter **all at once**. The general "rule of thumb" is to incorporate no more than 3 cubic yards of organic matter per 1,000 square feet per year. This is equivalent to 1-1/4 inches of amendment on the soil surface before it is tilled in. All amendments added should be thoroughly tilled into the soil, making it a uniform mixture.

The best organic amendments include relatively coarse, partially decomposed compost and aged barnyard manure. The type of manure is not important, but it should be at least one year old if planting is anticipated soon after amendment. Fresh manure usually is too high in ammonia, which injures plant roots. If the manure has a strong acrid odor, avoid using it or let the amended ground lie fallow for several months before planting. Because of high salts, avoid repeated use of most feedlot manures unless the salts can be leached

first. Dairy cattle manure generally is lower in salt content.

Coarse sphagnum peat is a good amendment but is expensive when compared with manure or compost. Avoid using the "native" sedge peats unless mixed with coarser material. Most are too fine in texture and can act as a "glue," further complicating a tight soil situation.

In addition to coarse sand, inorganic amendments include calcine clay products (such as Turface), pulverized volcanic rock (scoria), perlite (heat-treated limestone) and diatomaceous earth. These materials are comparatively expensive and probably feasible only to amend small plots or small amounts of potting soils.

Liquid Amendments

Like household detergents, liquid products break the surface tension of water around the soil particle and allow deeper water penetration. They in no way increase the pore space of a soil. The liquid "conditioners," therefore, cannot be considered as soil amendments and are properly called "adjuvants." At best, they may provide a temporary improvement of water penetration but do not "break up clay soils" as some claim. They are not substitutes for amendments.

What About Gypsum?

Gypsum is a salt -- calcium sulfate -- and when added to calcareous clay soils (the typical high calcium soil in Colorado), does no more than **increase** the already high calcium content. Thus, gypsum + calcareous clay = gypsum + calcareous clay. In other words, adding gypsum to a soil that does not need calcium is a waste of money. Also avoid adding gypsum to a saline soil (soil high in salts). Gypsum increases salt levels.

The use of sulfur in a clay soil high in calcium also has been acclaimed by some as a method of breaking up a tight soil. While sulfur added in small amounts over a long period of time eventually can improve the soil condition and reduce soil alkalinity, this practice generally is not advised because the sulfur reacting with the calcium simply forms gypsum.

The **only** soil that can be benefitted by adding gypsum is a soil high in sodium, called "sodic soil" or "black alkali." These soils normally are found where there is a high water table and poor drainage. Such soils are hard and cloddy when dry and take water very slowly. Few plants can survive in them.

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