



## MULCH CORNER

### IMPROVING THE SOIL WITH MULCH

*By John Ferguson*

This week I am just back from a vacation in Alaska. After spending the last 10 days in temperatures of 48-62 degrees, the return to high temperatures and humidity are quite a shock to the system. However, during my vacation I had the opportunity to spend some time in the temperate rain forests along Alaska's coast. The amount of lush vegetation was amazing, all growing without any artificial fertilizers or other toxic chemicals. The one item that stood out was the amount of decomposing material on the forest floor (e.g. mulch). As I dug around and studied this mulch layer I remembered this comment from Malcolm Beck, one of the early pioneers in teaching organic methods and composting in Texas.

*Walk into the woods or onto the prairies and look around; you will be in the presence of much life- plant and animal, large and small. Then look down; you will see an equal amount of death, many expired life forms covering the soil. You will find a mulch of dead things--twigs, leaves, grass, insects, manure, and even dead animals. Dig into the mulch and you will find it begging to decay--compost. The deeper you dig, the more advanced the decay until individual pieces fade into rich moist topsoil. Topsoil is the digestive system of the earth. It keeps the water and air clean and furnishes the food for all life. The quality of all life on earth--including human life--depends on the quality of the topsoil. That crucial thin layer of soil must be protected, maintained, built and nourished. The mulch cover of organic materials performs this service and much more."*

Malcolm Beck

"The Many Benefits of Mulching"

As was mentioned above, there are many beneficial microbes at work breaking down mulch and organic matter into soil components. I want to laugh when I hear inexperienced gardeners



often say, "The mulch was not any good, it just rotted away in only one year." Mulch and plant residues (litter, leaves, twigs, branches, root detritus and exudates, etc.) provide carbon (the energy source) which is the fuel (energy) for the soil foodweb that cycles and stores nutrients, creates soil structure, and prevents pathogens and pests from taking over. When we burn wood logs in our fireplace, the carbon in the wood is combined

with oxygen in the air releasing energy. The same thing happens in the soil. Carbon from decaying organic matter is combined with oxygen from the air, in the bodies of microbes, giving them the energy needed to create soil structure, fight pathogens and pests. If we do not feed our army of beneficial microbes then they will die and the pathogens and pests will take over. In other words, "WE WANT MULCH TO DECAY!" In a healthy soil with a good quality mulch, about 2/3 should decompose in a one year time frame. If one applied a 3 inch layer of a good mulch then one year later there should only be about one inch left. The remaining mulch will break down at a much slower rate providing other long term benefits to the soil.

*If the mulch does not break down, then the soil is very unhealthy, or you purchased a very low quality mulch.*

### **Improving soil with mulch:**

We have had several questions this week on improving clay soils. Should I use gypsum, sand, till or what should I do, etc.

Over 30 years of research have shown that clay soils rapidly improve in all aspects of soil quality and health when native mulch is applied. The microbes that decompose the native mulch also break the clay down at a mineralogical level changing it from clay into rich loam. It is not a fast process but each year native mulch is used the clay breaks down deeper and deeper and more rich fertile soil is formed.

Sandy soils respond well to compost mixed into the sand and compost used as a mulch, with a top dressing of 1 inch of native mulch. If the native mulch has been composted a few months, it will work even faster and provide additional benefits.

Many soils develop a condition called *hardpan* after repeated exposure to excessive use of synthetic chemicals. The soil becomes extremely tight and often very hard, hence the name. Air



and water cannot penetrate the soil, beneficial microbes and animals are limited. This hard layer can occur at the surface or inches below the surface. To correct the problem permanently one must quite applying the toxic chemicals. Composted native mulch works well in correcting this type of problem, just surface apply the mulch, water in and let the microbes go to work. In a few weeks you will start to see improvement in the soil under the mulch.

In general all types of organic mulches will improve all types of soils. Some just work faster than others. The amount of mulches used, how they are applied and handled, and the starting condition of the soil are all factors in soil improvement. As these materials break down they eventually become soil organic matter that we call *humus*. For healthy soils, the organic matter should be broken down enough that there are about 25- 30 carbon atoms for every atom of nitrogen present. We call this the carbon nitrogen ratio expressed as C:N (i.e. 30:1).

As organic materials age they breakdown into different type of chemicals that enter the soil. These basic constituents are grouped into some basic classes: cellulose, hemi-cellulose, lignin, water soluble fractions such as simple sugars, amino acids, and aliphatic acids (succinate and acetate), a protein fraction, an ether- and alcohol-soluble fraction (fats, oils, waxes, and resins). As organic material gets older, the content of the first 3 fractions increases and the latter groups decreases.

The native mulch (if composted first) makes an ideal ingredient to add to prepared soil planting mixes in small amounts. It helps lighten the soil mix, improves aeration and looseness, and most importantly provides a long term energy source (i.e. carbon) to help promote a healthy soil food web and billions of good microbes.

### **Erosion and Compaction:**

Rain drops can hit the ground with velocities between 10-20 mph (miles per hour) in normal conditions and over 60 miles per hour during severe storms. The kinetic energy associated with the raindrop increases as the square of the velocity ( $V^2$ ). If the soil is unprotected by a mulch layer, the impact dislodges the soil and erosion begins. Compare this to the surface runoff on near level areas where the rain water only moves about 1-2 mph. Of course on slopes, gullies and streams the water can move much faster and carry away the valuable topsoil knocked loose by the raindrop. Another effect associated with raindrops hitting bare soil is surface



sealing. This occurs when the dislodged soil particles wash down into the soil pore space and clog it up. This creates a thin compacted zone at the surface that seals off the soil, preventing rain water to soak in greatly increasing runoff and more erosion. When this seal dries it can become very hard and create a crust. This crust can prevent seeds from germinating and penetrating the layer. Since water cannot easily enter the soil, many roots and microbes can suffer or die from water stress or lack of water. Air flow into the soil is reduced preventing oxygen from reaching plant roots and microbes. It also allows gases to build up that are toxic to many

plants and soil animals. The resulting conditions favor the growth of pathogens in the soil. Another reason to always use a good mulch to protect the soil.