



NEWS FROM THE WONDERFUL WORLD OF SOIL AND PLANTS

By John Ferguson

With spring around the corner, I want to continue to talk about plant nutrition and go a little deeper into minerals and elements.

I read an interesting article a while back on minerals. To date, mineralogists have classified over 5,600 different minerals. Gardeners need to be careful on marketing claims as there are over 100 minerals that contain the element calcium required for good plant growth...but only one element calcium (Ca).

There are 94 naturally occurring elements found on earth. The most common one's range in atomic number from 1-82 and all except two of these have stable isotopes (do not decay). These elements combine in many ways to form our minerals.

Research has shown that 80% of the minerals required water during their formation process in some form or fashion. In addition, these elements can combine in different ways which gives them different chemical and physical properties.

For example, the mineral calcite which is calcium carbonate (CaCO_3) also known to many as limestone, can combine in at least 17 different ways. Journal American Mineralogist July 2022

Carbon (C) can be in many forms from the mineral graphite which is used in pencil lead as it is very soft or as diamonds which are extremely hard. Graphite and diamond share

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the same composition (carbon) but the different crystal structures give them very different properties.

Another example is the mineral Halite which is common table salt that is composed of the elements sodium and chlorine (NaCl). This mineral normally occurs in what is called a cubic crystal structure where it easily dissolves in water.

In one of my mineralogy classes my professor explained that in ancient times ovens were often lined with Halite to help hold the heat for more even cooking. However, after repeated heating the sodium and chlorine atoms would rearrange themselves depending on impurities where it would not easily dissolve in water, hence lose its flavor (see reference in Luke 14:34-35). Depending on other elements present different mineral or crystal forms can occur.

For gardeners understanding this process between minerals and the elements is very important.

Secondly, the same elements arranged in a different crystal structure often has different physical and chemical properties.

Third, a soil test using a strong acid may look like there is a lot of a given element. However, in the soil the element is often locked up chemically due to its crystal form and NOT available to plants. Hence, the results from soil testing using strong acid methods can be mis-leading. See January 7th newsletter #469 for more information on testing.

Many minerals are formed in molten lava as it cools like those found in granite and basalt. These minerals were stable at the high temperatures and pressures where they were formed, however in our soils they are not stable since there is very different

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temperatures and pressure. This allows the microbes and plant roots to release the elements for their use. Other minerals are formed under intense pressure in our oceans like those found in greensand.

This is why products like Re-mineralizer (a blend of granite, basalt, and green sands) works so well at providing minor and trace elements to our gardens, giving us healthier plants.

Most of the elements released from the minerals in the soil is done by microbes. Hence for gardeners to get the best results one needs very high microbial density and diversity.

So how does a gardener get high microbial density and diversity in their soils?

It is very simple:

- 1) As in medicine the first step is "Do No Harm." Thus, do not kill the microbes by using toxic chemicals (fungicides, pesticides, herbicides, salts, artificial fertilizers, chlorinated water, etc.).
- 2) Give the microbes food to eat and grow. This is done by using products like compost, aged native mulches, organic fertilizers, humates, and related products.

When I was in college, soil science was all about the chemistry and physics of soils. Today we know that the biology of soils is ten times more important than the chemistry and physics put together.

There are three great and easy to understand books on soil biology that every serious gardener and homeowner should read:

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Teaming with Microbes, A Gardener's Guide to the Soil Food Web, 2nd Edition, by Jeff Lowenfels & Wayne Lewis, Timber Press, 2006, ISBN-13:978-0-88192-777-1

Teaming With Fungi: The Organic Growers Guide to Mycorrhizae, by Jeff Lowenfels, Timber Press, 2017, ISBN: 978-160469-729

Teaming With Bacteria: The Organic Growers Guide to Endophytic Bacteria and the Rhizophagy Cycle, by Jeff Lowenfels, Timber Press, 2022, ISBN: 978-1-64326-139-3

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