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NEWS FROM THE WONDERFUL WORLD OF SOIL AND PLANTS

By John Ferguson

Subject: microbes and minerals rare earth elements scandium V-D yttrium

Every day we are learning more and more about the importance of microbes in our soil to enable us to have healthy plants. For example, many soils have limited iron (Fe) availability which then limits plants growth.

Sometimes this occurs due to low levels of iron in the soil or sometimes the iron is locked up chemically in mineral forms the plant cannot absorb, hence it is unavailable.

Researchers at the Max Planck Institute for Plant Breeding Research have discovered that plants release signaling chemicals from their roots that direct certain species of bacteria to mobilize iron so the plants can absorb it. The bacteria break apart the chemical bonds releasing the iron. Cell Host & Microbe, 2020

We regularly hear about the benefits of re-mineralizing our soils. For example, there is a group of elements known as REE (Rare Earth Elements). These are a set of 17 elements (15 of which are lanthanides plus scandium and yttrium).

A series of studies from China have shown that these elements when present in the soil, accelerated plant cell growth and enhanced production of plant secondary metabolites (often these secondary metabolites are the anti-cancer compounds) as well flavonoids and phenols that are used to counter some diseases and oxidative stress in humans.

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Other studies have shown that cerium (Ce), lanthanum (La) and praseodymium (Pr) showed positive effects on plant growth and stimulated the production of secondary plant metabolites. Other studies have shown that REE's increased root production even at low concentrations. HortScience (2020)

We never see scandium listed on a bag of fertilizer. However, from our study of the elements a couple years ago, this element is essential for good human health as scandium occurs at higher concentrations in our heart and bones. Scandium has been found in association with the amino acid proline.

It is well known that Vitamin -D is essential for good health and helping our immune system fight diseases like covid. However, other studies have shown that the vitamin-D molecule has to have scandium to work effectively. If one does not have scandium, then V-D cannot function effectively. Other work has discovered that the human body needs adequate boron to utilize scandium.

Scandium has been found in 3% of the plants tested, with vegetables having 5 ppb (parts per billion) and grasses 70 ppb while "tea" leaves can have 140 ppb.

Scandium is used as a seed germinating agent when applied as scandium sulfate ($\text{Sc}_2(\text{SO}_4)_3$) in a dilute solution to corn, peas, wheat, and other plants. It increases the number of seeds successfully germinating.

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Scandium content is higher in old leaves and roots as compared to younger leaves and some herbs have scandium at levels up to 2 ppm.

The article on REE above also mention Yttrium (Y). This element also enhances normal cell growth and doubles the lifespan of laboratory animals. In rodent studies, 14% of the ingested Yttrium can be detected in the newborn mice. Yttrium has been detected in nucleic acids, and even human breast milk contains 4 ppm of Yttrium.

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A deficiency of yttrium has been linked to several metabolic diseases like Lou Gehrig's, Alzheimer's, multiple sclerosis, and Parkinson's diseases. In the absence of certain required trace elements, DNA will make use of substitutes. One doctor has found that if there is an Yttrium deficiency, which is used at junction of a gene and DNA molecule, without Yttrium, the body uses aluminum which is a different size atom that results in misalignment of the gene and a genetic mutation due to nutrition occurs.

Most plants have about 0.6 ppm of yttrium. However, many *edible plants* may have 20-100 ppm with cabbage at the higher end of the range.

The seeds of woody plants can have 700 ppm of yttrium. Nuts are seeds, and are some of the healthiest foods we can eat. Is this a coincidence, or did God know what he was doing.

As you can see from the above it is important to Re-mineralize our soils if we want healthy, plants, pets, and people.

This is an example of why I always recommend a quality organic fertilizer like Microlife™ along with Re-mineralizer to provide additional trace and micronutrients.

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