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JOHN'S CORNER:

MINERALS - The Elements and What They Do (Part 12)

by John Ferguson

20) Calcium (Ca) - Calcium is the fifth most common element on earth and is found all over the world and in many forms. Calcium is essential to all known life forms.

Calcium can be found in igneous rocks at 41,500 ppm, shale's at 22,100 ppm, sandstone at 39,100 ppm, limestone at 302,000 ppm, in marine plants from 10,000-300,000 ppm, land plants at 18,000 ppm, and land animals from 200-260,000 ppm. Bones of mammals contain 260,000 ppm calcium.

Pure calcium is a firm silvery metal, and only when found in compounds is it chalky. It is a member of the alkaline earth metal group on the periodic table.

Often found in nature as the mineral calcite (CaCO_3) that we know as limestone. It is used in our bones and teeth, and to make seashells and coral reefs. In mammals, calcium cannot be utilized efficiently unless there is adequate magnesium.

Calcite in soils can occur as coatings, nodules, cemented layers, or silt and clay sized particles. Calcium carbonate (limestone) is often found to be the cementing agent to make sandstones. Common chalk is made of gypsum, which is calcium sulfate (CaSO_4). We find calcium in Lime as calcium oxide (CaO) which was commonly used to make mortar in ancient times. If we add water (H_2O) to Lime it becomes slaked lime which is calcium hydroxide ($\text{Ca}(\text{OH})_2$) and often used to neutralize acidity in acid soils.

Calcium in the form of gypsum is used to make the drywall that we use in our homes. If gypsum is in its crystal form, it is the mineral we call alabaster.



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Calcium plays an important role in maintaining the pH (acidity/alkalinity) of the soil, which affects nutrient uptake by plants. Calcium can help break up clay soils by flocculating them (breaking them up into flakes).

Many foods (sardines, eggs, cheese, cabbage, etc.) contain lots of calcium; however, the human body cannot utilize calcium without large quantities of Vitamin-D!

In human health, a lack of calcium is associated with osteoporosis, kidney stones, and over 147 disease/health problems from receding gums, arthritis, Bell's Palsy, hypertension, bone & heel spurs, cramps & twitching, PMS, and lower back pain.

Today many foods have far less calcium than 80 years ago; one book stated that apples now have 50% less calcium. The very low quality of our food supply is why more and more Americans are growing their own fruits and vegetables organically.

Gardening and Landscaping Problems Associated with Calcium (Ca)

Calcium is sometimes called the prince of nutrients, since it is so vital to soil functioning and nutrient uptake by plants. Calcium is most critical in low humus soils (low organic matter) as between 0.1 to 4% of a plants tissue (compounds) contains calcium. It is used in cell wall construction; it is involved with pH management, maintenance of balanced hormone and enzyme systems. To have healthy plants there must be adequate calcium as it is involved with a plants immune systems from insect resistance, bacterial or fungal attack to weed control.

Soils that have the correct amount of calcium content are associated in plants with increased protein content, which is then associated with increased vitamin content. Calcium is also involved with enzyme production in plants.

Calcium can improve soil texture; it helps make phosphorous and other micronutrients more available. It aids in the growth of both symbiotic and non-symbiotic nitrogen fixing bacteria, it is very important for many microorganisms living in the soil, and important in water absorption by plants.



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Proper amounts of calcium helps plants form better stems, grow better leaves and root systems for efficient sunlight energy, water, carbon dioxide, nitrogen, and mineral nutrient extraction.

For many gardeners the most common deficiency is blossom end rot in tomatoes that is a classic calcium deficiency. Calcium deficiencies show up as weakened new growth and the lack of ability to stand upright as calcium adds structural strength. Low calcium in soils is associated with stunted roots and stress symptoms on newer leaves, including discoloration, distortion or other symptoms. Young leaves turn yellow then brown, growing tips bend from weak stems, and only short dark roots form. A calcium deficiency can lead to a manganese (Mn) toxicity issue allowing too much to be absorbed.

Overuse of calcium in the form of gypsum, causes deficiencies of iron (Fe), magnesium (Mg), manganese (Mn), phosphorous (P), and zinc (Zn). Some studies indicate excess calcium prevents mycorrhizal fungi from colonizing roots. Excessive calcium will cause magnesium, phosphorous and other minor element deficiencies resulting in poor plant health, which then leads to increased insect, fungal, and bacterial attacks.

If there is plenty of good quality organic matter in the soil, the good fungi can store excess calcium in the form of calcium oxalate (CaC_2O_4) crystals that they grow on their hyphae bringing the nutrients in soil back into balance. When we use a fungicide, we lose this benefit. Plants can also store calcium as calcium oxalate crystals to bring the calcium levels back into balance with other nutrients.

Sources: compost, native mulches, granite sand, greensand, gypsum, powdered limestone