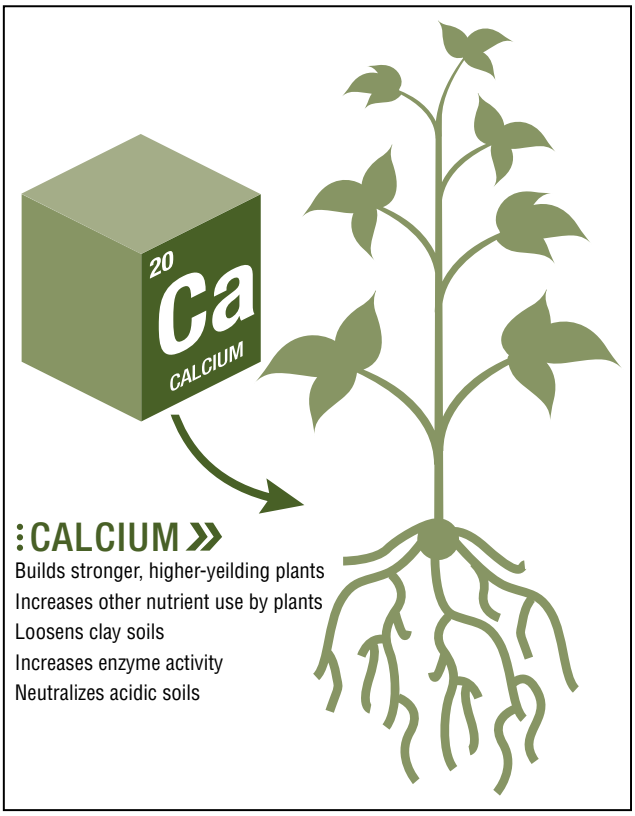
EDUCATION 701

MK Minerals, Inc.

AN IN-DEPTH LOOK AT CALCIUM

IS CALCIUM A MICRO OR SECONDARY NUTRIENT?

Over the years many have considered calcium a secondary plant nutrient, but it is grossly underrated. Most agronomic an plant specialists today realize it is as important as nitrogen, phosphorus and potassium in quantity for plant health and vigor.



WHY IS CALCIUM IMPORTANT?

There are many key items that calcium provides to the plant and the soil.

- It is an essential part of the cell wall in plants and must be present in order to form new cells (grow).
- It also affects clay soils by loosening the electrochemical bond between clay particles. This allows better water and air penetration into otherwise “tight” clay soils.
- It is essential for nitrate uptake and metabolism. It increases the efficient use of the other major nutrients that a plant requires.
- Increases enzyme activity.
- In the form of Calcium Carbonate, it increases the pH in an acid soil (below 7.0)

ARE pH AND CALCIUM THE SAME THING?

No! Many times your soil may need calcium even though soil pH appears within an optimum range for what you are growing. Taking a soil pH to decide whether or not you need calcium is like checking the oil in your car to if it is out of gas.

Many times a disappointing yield in farming programs can be tied to a low level of available calcium. Of course, plants can’t respond to calcium if other yield limiting factors stand in the way. Things such as nitrogen deficiency, phosphorus shortage, insect disease, or drought can affect response to calcium, but a common denominator of poor yields in many farming programs is low soluble calcium levels in the soil.

SO WHAT IS pH?

Soil pH or soil reaction is an indication of the acidity or alkalinity of soil and is measured in pH units. Soil pH is defined as the negative logarithm of the hydrogen ion concentration. The pH scale goes from 0 to 14 with pH 7 as the neutral point. As the amount of hydrogen ions in the soil increases, the soil pH decreases thus becoming more acidic. From pH 7 to 0 the soil is increasingly more acidic and from pH 7 to 14 the soil is increasingly more alkaline or basic.

WHY IS PH IMPORTANT?

The effect of soil pH is great on the solubility of minerals or nutrients. Fourteen of the seventeen essential plant nutrients are obtained from the soil. Before a nutrient can be used by plants it must be dissolved in the soil solution. Most minerals and nutrients are more soluble or available in acid soils than in neutral or slightly alkaline soils.
Phosphorus is never readily soluble in the soil but is most available in soil with a pH range centered around 6.5. Extremely and strongly acid soils (pH 4.0-5.0) can have high concentrations of soluble aluminum, iron and manganese which may be toxic to the growth of some plants. A pH range of approximately 6 to 7 promotes the most ready availability of plant nutrients.

SO WHAT IS THE RELATIONSHIP BETWEEN PH AND CALCIUM?

When a soil pH is low (acidic), this is quite likely an indication that the soil is low in calcium. By applying calcium in the form of calcium carbonate (lime) in the proper form (in a fine particle size), then it will serve two purposes. One, it will provide to the plant the calcium that is deficient in the low pH soil and it will start to improve (increase) the pH of the acidic soil.

Soils that are high in pH (alkaline) may have plenty of calcium, but that cannot be assumed. First of all, the alkaline situation my be caused by too much salt or magnesium in the soil. This will lead to extremely tight soils and also result in other key nutrients being "tied up" in the soil and not available to the plant. In this case, calcium in the form of calcium sulfate is the answer for this condition. It will provide the proper ratio of calcium to magnesium and will also take care of excess salts in the soil.

IS THERE A RELATIONSHIP BETWEEN PHOSPHORUS AND CALCIUM?

Yes! And it is critical for proper plant growth. Phosphorus (P) in an essential element classified as a macronutrient because of the relatively large amounts of P required by plants. Adequate P availability for plants stimulates early plant growth and hastens maturity. Maintaining soil pH between 6 and 7 will result in the most efficient use and availability of phosphate to the plant.

In soils with a pH below 6.0, Aluminum (Al) becomes the dominant ion and reacts with the phosphorus and create very insoluble compounds of phosphate.

This is why it is not uncommon to have plants become unhealthy (not grow) because of phosphorus deficiency despite soil tests that indicate high levels of phosphorus in the soil (even after application of phosphorus). Low levels of calcium indicate low pH levels, which severely limits the availability of phosphorus to the plant.

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OK, I NEED PUT CALCIUM IN MY SOIL, WHAT DO I NEED, LIME OR GYPSUM?

- Lime (Calcium Carbonate) should be used on soils with pH levels below 7.0
- Gypsum (Calcium Sulfate) should be used on soil with pH levels above 7.0

HOW IMPORTANT IS FINENESS OF THE CALCIUM CARBONATE OR CALCIUM SULFATE?

There are really only two important factors in considering the quality of either of the products.

The first is the amount of calcium in the product. Calcium levels of 33-36% are considered very good for a calcium carbonate product (lime). The calcium level in calcium sulfate should be 20-23% and the sulfate level should be 14-16%.

The second (and just as important) critical factor is the fineness of the particle. Calcium is not very water soluble, therefore it must be provided to the soil in a form that can be utilized by the plant and soil (soil solution) in order to get the expected result. Simply applying large particles of either product to the soil can be a waste of time. It must be in a fine particle in order to get the expected result. This allows the calcium to move in to soil solution and immediately become available. Finer particle sizes also create more surface area for the reaction that is desired. This is why the amount of tonnage needed to get the desired result decreases if the particle size decreases.

HOW IS FINENESS MEASURED?

It is measured in the amount that will pass through a "mesh" screen. For example, a 200 mesh screen means there are 200 openings per square inch, which is finer than a 100 mesh screen (100 openings per square inch).

ARE MK MINERALS PRODUCTS FINELY GROUND (SMALL)?

Yes, the smallest in the industry. Before pelletizing (making into a granule), the MK products are pulverized into a very fine powder. This powder is then rolled into a granule by using a binding agent. When applied, the granule immediately breaks down and the fine grind powder is available for use by the soil and plant

Prior to pelletizing (making into a granule) the fineness of the MK products are as follows:

MK High-Cal Pelletized Lime
98% passing through a 60 mesh screen
93% passing through a 100 mesh screen
75% passing through a 200 mesh screen

MK Pelletized Gypsum
98% passing through a 60 mesh screen
94% passing through a 100 mesh screen
77% passing through a 200 mesh screen

MK Dolomitic Limestone (Contains 17% calcium and 10% magnesium)
98% passing through a 60 mesh screen
91% passing through a 100 mesh screen
70% passing through a 200 mesh screen

The fineness of the pulverization of the MK products is what separates it in the industry and is why end users have had success at very low rates of application.

WHY SHOULD I CONSIDER USING GYPSUM (CALCIUM SULFATE) IN MY SOIL?

There cannot be enough said about the benefits, advantages and utility of using high quality gypsum with soils. Invariably gypsum helps soils and plants for one reason or another since in nature it is unique and incomparably versatile and multi-functional. Gypsum serves without equal as a fertilizer, a soil conditioner and a soil amendment.

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MAJOR BENEFITS OF GYPSUM TO SOIL AND PLANT

- An excellent source for calcium and sulfur. Most soils today are deficient in either calcium or sulfur (or both) and gypsum is a very inexpensive source of both nutrients.
- It improves the soil structure and compacted soils. Calcium provided to the root zone flocculates (or combines) sand, silt, clay and humus particles together, thus improving water and air movement and plant root growth in the soil. When soil is compacted, water penetration problems result in ponding and runoff, depriving root systems of needed moisture and oxygen.
- Amends and reclaims soils high in destructive sodium (salt) and magnesium. Sodium and magnesium act the opposite as calcium in soils by destroying structure and reducing water, air movement and root growth.
- Replaces harmful salts. Sodium, chlorine and many other salts in higher levels in irrigation water and soil are detrimental to plant growth and development since they rupture and destroy plant cells.
- Enhances water use efficiency. Twenty-five to 100 percent more water is available in gypsum treated soils versus untreated soils; less irrigation water is required to achieve the same results.
- Reduces runoff, erosion and soil crusting. Erosion begins when rain or irrigation drops strike bare soil detaching soil particles. Aggregates stabilized by gypsum are less prone to crusting and erosion since there is limited runoff due to larger, more stable aggregates.
- Counteracts acidity in subsurface soils. Gypsum leaches into the subsoil replacing aluminum and other acid forming ions, thus allowing roots to penetrate the hostile subsoil more readily.
- Along with composts, manures and other plant materials, use of gypsum helps rebuild the supply of soil organic matter, and is a major means for increasing the efficiency of its accumulation.