Roles of Calcium, Magnesium, and Sulfur in Plant Growth

When farmers and gardeners are managing the fertility of their soil, most of the time they are applying nitrogen, phosphorus, and potassium. This is because these nutrients are used by plants in greater quantities than any other nutrients. There are several other nutrients that are not needed in such great quantities but are just as essential to plant growth. Three of the most important of these are calcium, magnesium, and sulfur.

Calcium is essential for plant cell elongation and division, or plant growth. Plants grown in soils that are deficient in calcium will fail to develop terminal buds of shoots and apical tips of roots, which causes plant growth to cease. In corn, calcium deficiency prevents the emergence and unfolding of new leaves while in fruits vegetables calcium deficiency causes disorders such as blossom-end rot in tomato and bitter pit in apples. Special attention must be given to crops which are unable to obtain sufficient calcium from the soil, such as peanuts, tomatoes, and celery; as well as to crops that have high calcium requirements, such as alfalfa, cabbage, potatoes, and sugar beets. The primary source of calcium as a fertilizer is lime, which is also used to neutralize soil acidity.

Magnesium is a primary constituent of chlorophyll and without chlorophyll plants would fail to carry on photosynthesis. If a plant does not carry on photosynthesis, leaf tissue will turn yellow, then brown, and finally become necrotic. Magnesium also serves as a structural component in ribosomes, stabilizing them in the configuration necessary for protein synthesis. Magnesium deficiency would cause the proportion of protein nitrogen to decrease and that of nonprotein nitrogen to increase. This is especially important in forage crops where high protein levels are necessary to produce a high quality feed. The most common sources of magnesium fertilizer are dolomitic limestone (for agricultural fields) or epsom salts (for gardens).

Sulfur is required for synthesis of a number of amino acids which are essential components of protein. Plants suffering from sulfur deficiency will accumulate nonprotein nitrogen in leaf tissue and will influence the food quality of vegetables. Plants experiencing sulfur deficiency will exhibit symptoms similar to nitrogen deficiency, such as stunting or a uniform yellowing of the plant. Plants that are sulfur deficient are commonly misdiagnosed as being nitrogen deficient. Row crop producers often mix ammonium sulfate with Roundup prior to application and, as a result, these fields are rarely deficient in sulfur. Sulfur deficiency is more commonly found in gardens or forage fields.

Even though these nutrients are not needed in great quantities, they are still essential to plant growth. Farmers and gardeners should test their soil to determine if levels of these nutrients are adequate, especially if it has been more than a few years since the soil was tested. For more information on these nutrients or soil testing, contact Travis Harper at the Henry County Extension Center by phone (660)885-5556 or e-mail harpertw@missouri.edu .