Magnesium Nutrition and Metalosate® Magnesium

by Jeremy O'Brien

Soil Magnesium

The magnesium content of most soils generally ranges between 0.05% (for sandy soils) and 0.5% (for clay soils). The distribution of magnesium in soils can be divided into non-exchangeable, exchangeable, and water-soluble forms. These three forms are in equilibrium. By far, the largest fraction of soil magnesium is in the non-exchangeable form which includes all the magnesium in the primary minerals and most of the magnesium in the secondary clay minerals. Exchangeable magnesium is usually about 5% of the total magnesium and this fraction along with the water soluble magnesium is of greatest importance in the supply to plants. Exchangeable magnesium normally constitutes from 4 to 20% of the cation exchange capacity. It is thus normally considerably lower than Ca which is approximately 80% and higher than potassium which can be up to about 5%.[1]

The level of magnesium in soils depends to a large extent on the soil type. Highly leached and weathered soils are generally low in magnesium. On the other hand, soils formed in depression sites, where leached nutrients may accumulate, tend to be high in magnesium.[2]

Magnesium Utilization by Plants

Magnesium is generally taken up by plants in lower quantities than calcium or potassium. The content of magnesium in plant tissues is usually about 0.5% of the dry matter. Cation competitive effects in uptake are of particular importance for magnesium as such effects frequently lead to magnesium deficiency in the field.

High potassium levels in the soil can result in magnesium deficiency in plants. Conversely, data has also shown that high magnesium contents may occur in plants supplied with a low level of potassium nutrition. These higher magnesium contents cannot be explained simply in

Figure 1. Magnesium Deficiency in Citrus
Photo courtesy H. K. Wutscher and P. F. Smith.
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American Phytopathological Society, St. Paul, MN.

terms of a concentration effect resulting from a lower rate of growth but probably originate directly from enhanced magnesium uptake from low levels of potassium nutrition.[3]

The transport of magnesium in plants is similar to that of calcium. Higher levels of magnesium are usually found in the older leaves when compared to the younger leaves. Magnesium, like calcium, moves upwards in the transpiration system. In contrast to calcium; however, magnesium is also mobile in the phloem system.

The most well known role of magnesium in the plant is its occurrence at the center of the chlorophyll molecule (see Figure 2). The fraction of the total plant magnesium associated with chlorophyll, however, is relatively small and only about 15 to 20%. In addition to its function in the chlorophyll molecule, magnesium is required in other physiological processes. One major role of magnesium is as a cofactor in almost all enzymes activating phosphorylation processes (combining an inorganic compound with phosphorous). Magnesium also has an essential function as a bridging element for the aggregation of ribosome subunits, a process that is necessary for protein synthesis.[4]

Magnesium Deficiency

Magnesium deficiency symptoms differ between plant species although some general characteristics are apparent. Since magnesium is mobile in the plant, deficiency begins in the older and then moves to the younger leaves. Intervenial yellowing or chlorosis occurs and in extreme cases the areas become necrotic. Another characteristic particularly of plants exposed to strong sunlight is their generally withered appearance. The look is similar to that of potassium deficiency where the water content of the plant is disturbed. Individual leaves suffering from magnesium deficiency, however, are stiff and brittle and the intercostal veins are twisted. Magnesium-deficient leaves often fall prematurely.[5] Plants that are inadequately supplied with magnesium often show a delay of the reproductive phase.

Correcting Magnesium Deficiencies with Metalosate® Magnesium

The research data generated over the years in respect to Metalosate Magnesium consistently indicates that Metalosate Magnesium applied in combination with other Metalosate products has very positive results. Some examples of these instances are listed below.

The application of Metalosate products to snap beans in Oregon. Metalosate Calcium, Magnesium, and Boron applied

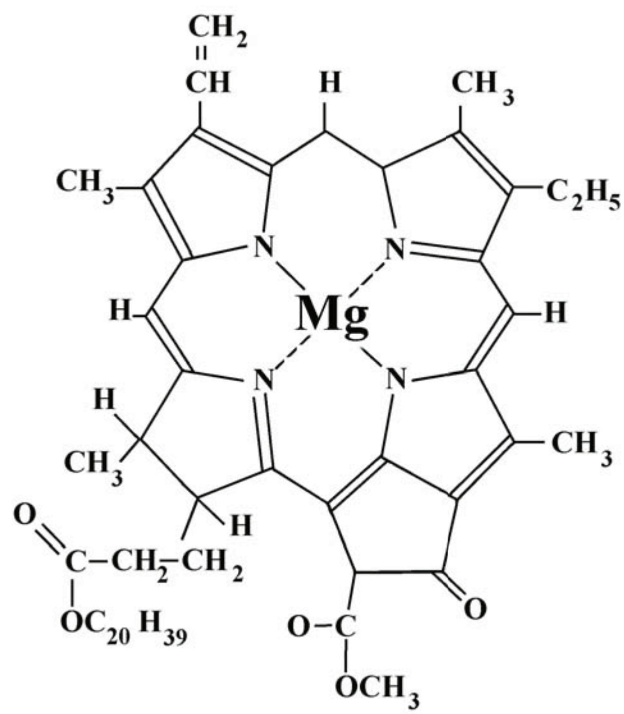

Figure 2. Chlorophyll molecule. Notice the Core Element is Magnesium

to field-grown snap beans resulted in an increase of 7.37% in total yield of beans per acre. The yield increased from 9.09 tons/acre (20.37 metric tons/hectare) to 9.76 tons/acre (21.87 metric tons/hectare). This yield increase added more than $100 per acre ($246 per hectare) in value.

Metalosate products applied to yellow storage onions in Washington was another project where a combination of Metalosate products were applied to a crop resulting in significant yield increases. In this particular project Metalosate Calcium, Copper, and Magnesium were applied by air one time to a test strip in a field of onions. The result was that the yield on the treated acreage increased by 7.8 tons/acre (21 metric tons/hectare). The number of colossal and jumbo-sized bulbs increased dramatically while the number of medium-sized bulbs decreased.

These represent only two of many instances where a combination of Metalosate products including Metalosate Magnesium resulted in significant yield increases for the growers.

If you have questions regarding Metalosate Magnesium and how it can benefit you and your customers please contact your local Albion Plant Nutrition representative.

References

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4. Marschner, H. (2002) Mineral Nutrition of Higher Plants (2nd ed.) (p. 279). San Diego, CA: Academic Press.
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