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Manganese in Crop Nutrition

By Jeremy O'Brien

Soil Manganese

Soil manganese levels can be extremely variable depending upon location. On average, manganese levels between 200-3000 ppm are most common. The most commonly found manganese fractions in the soil are Mn^{2+} and manganese oxides. The divalent manganese cation (Mn^{2+}) is adsorbed to organic matter and clay particles in the soil and represents the most important form of manganese in the soil. It is in this form that manganese is available to the plant. In addition to this form of manganese there is also easily reducible manganese which contributes to "available manganese" in the soil.

Since much of the available manganese in the soil is dependant upon the chemical reduction process, the factors which influence this process have



Manganese Deficient Cherry Leaves Image courtesy of The Potash & Phosphate Institute

great impact upon manganese availability. These factors include soil pH, organic matter content, microbial activity, and soil moisture. A water logged soil would favor the chemical reducing process, with the result being a very high level of manganese availability.

Manganese availability is also higher in acid soils due to higher solubility of manganese compounds under low pH conditions. It is significant to realize that available Mn^{2+} decreases 100 fold for each unit increase in pH. This explains why liming can significantly reduce manganese availability.

Manganese is Physiology

Generally, manganese uptake rates are lower than for other divalent cations (Ca^{2+} , Mg^{2+}). Manganese is relatively immobile within the plant and is preferentially translocated to meristematic tissues. Young plant organs are generally very rich in manganese.

In enzymatic and biochemical functions within the plant, the functions of manganese and magnesium are similar and interchangeable in many cases. Manganese is essential in the photosynthesis process, where it participates in photolysis. Photolysis is the oxidative splitting of water molecules that is an essential step in photosynthesis. Also, chloroplast structure is impaired when manganese deficiencies are present.

Manganese Deficiency

Manganese deficiency symptoms often resemble magnesium deficiencies as the plant uses both very similarly. Interveinal chlorosis is the most commonly observed symptom. In contrast to magnesium deficient leaves which are most often older leaves, manganese deficiency symptoms will be seen on the new, young tissue. Critical levels of manganese in dry plant matter are in the range of 15-25 ppm. Some notable crops which typically suffer from manganese deficiency include: oats, peas, apples, cherries, citrus, raspberries, and sugar beets.

Correcting Manganese Deficiencies

The application of manganese salts to the soil ($MnSO_4$) is usually of little or no use in alleviating deficiency because the applied Mn^{2+} is rapidly oxidized. It is possible to band apply manganese salts with limited success. Foliar application of manganese fertilizers has proven to be the most effective method for correcting manganese deficiencies. With Metalosate[®] Manganese it is possible to provide adequate manganese levels for optimized yield with applications of 16-32 fluid ounces per acre (1.2-2.3 liters per hectare) per application.

Check with your local Albion Advanced Nutrition representative for specific application rates and timing for your specific crops and growing conditions.

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