
# TRACE Minerals... and WHY your plant needs them.


**The root uptake of the trace elements. . .**
**IRON (Fe), ZINC (Zn), MANGANESE (Mn), and COPPER (Cu)**
**is governed by three basic principles.**

**1. Their presence in the soil**. Many ag soils have very low levels of native Zn, Mn, and Cu and they need to be added as fertilizer to maximize crop production. There are also soils where one or more of these trace elements is abundant but they are tied up by the soil.

**2. Their presence in the soil solution.** It is the soil solution (the water in the soil) that delivers all nutrients taken up by roots. Practically all nutrients are taken into the roots in their dissolved, ionic forms.

**3. The ability of the plant and the rhizosphere** to increase the amount of micronutrients that are in solution and available for root uptake.

A soil solution that is acidic will dissolve more metallic micronutrients from the surrounding soil than a soil solution that is alkaline. It is a chemical principle that acids dissolve minerals. But metallic trace elements are not the only essential elements we want in the soil solution so we must not get too acidic or other nutrients will be less available. Conversely, if the soil solution is alkaline, copper, zinc and manganese will get tied up and be unavailable.

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**Typically, trace mineral nutrition is more of a problem with alkaline soils. Several strategies are used to correct this:**

**Banding acid reacting fertilizers** like polyphosphates and thiosulfates which lower the pH in their zone of influence and bring more trace elements into solution simply by acidifying their local environment.

**Use of chelators.** A chelator allows metals to stay in solution in an alkaline environment by keeping it away from the soil which wants to bind it up tight. For very alkaline soils the strongest chelators, like EDTA, are used effectively. For mildly alkaline soils less aggressive chelators, like lignosulfonates, do a good job.

**Enhance the availability of TRACE Minerals by improving soil biology.**

A plant, especially a vigorous plant, has tremendous ability to transform its root environment. Sometimes the roots do this **directly** by exuding siderophores to scrape an iron off the mineral fraction of the soil and deliver it back to the plant.

**Indirectly,** plants exude various acids to lower the pH of the soil solution... making the soil water much more effective at dissolving trace elements in the soil. An excellent example of this was observed on a field of wheat beside a field of potatoes.

The native soil tested **8.4** pH. The pH reading in the potato row where the polyphos band was placed was **6.7**. In the wheat, just a hundred feet away, where the preplant fertilizer was applied, the pH in the root zone measured **7.1**. It's impressive what the phos fertilizer did - but even more impressive what the wheat did all by itself.

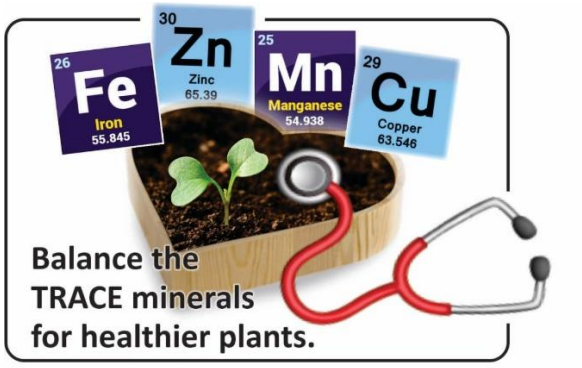
Acidifier

The most important acidifier, in terms of total amount of nutrients put into solution, is good old weak carbonic acid. Carbon dioxide, exhaled from roots and especially from microorganisms, dissolves into the soil water and makes it more acidic. More acidic makes it a better solvent. A solvent is a better solvent because it puts more minerals into solution.

Both the plant and the microbes put out a myriad of different kinds of molecules each with the purpose of getting more soil bound nutrients into solution and available for plant uptake.

A plant with a robust, active rhizosphere generally has superior mineral nutrition. Most interestingly, plants with superior trace mineral nutrition have far fewer problems with yield-robbing and quality-killing diseases.

Ask us to assist in selecting the best product combinations to achieve the proper balance of trace minerals for your crops.

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Give us a call today so we can help you maximize your Total Farm Profitability.

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