

Iron

Micronutrient Profile



Iron (Fe) is one of the 17 essential plant nutrients required for growth and reproduction. However, it's not always available in adequate quantities to meet a crop's requirement. Factors like depletion, nutrient balance, and soil chemistry can impact the plant's ability to absorb Fe.

Iron's Function in Supporting Plant Growth

Iron is involved in many important molecules and processes in plants. Its crucial role in the manufacturing of chlorophyll is one of the reasons for the yellowing of crop leaves. Fe is also important in many other roles in the plant. Fe is involved in:



Enzyme
Activation



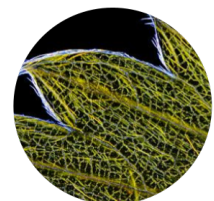
Respiration



Nitrogen
Fixation



Photosynthesis



Chlorophyll
Synthesis

The importance of Fe in crop production cannot be understated.

Factors Affecting the Iron Available to Plants

Iron quantities in most soil is high. However, due to low mineral content and Fe solubility, plant deficiencies occur. Fe deficiency is commonly observed on high pH, calcareous soils in arid regions.

- Soil pH – In high pH soils ($\text{pH} > 7.5$), the solubility of Fe minerals is reduced, and plant-available Fe can be low. On acidic soils with a pH below 4.5, iron is typically sky high and can be toxic.
- Free lime (CaCO_3) – Free lime contributes to a high soil pH, which corresponds to low solubility of Fe minerals. This results in low available Fe, commonly referred to as “lime-induced iron chlorosis.”
- Bicarbonates – The bicarbonate ion in soil is commonly a result of the dissolution of CaCO_3 or the addition of irrigation water. It contributes to high soil pH and low Fe availability.
- Nutrient Interactions – When nutrients like copper (Cu), manganese (Mn), zinc (Zn), and phosphorus (P) are elevated, they can also cause iron deficiencies.
- Soil temperature – Cold soils slow down the availability and uptake of Fe.
- Oxygen – Low levels of O_2 from compacted or saturated soil contribute to Fe deficiency.

In Western soils, high free lime and soil pH (> 7.5) are the primary causes of Fe deficiency. However, there are other factors that could be affecting your crop production, and you will need to consider these when deciding on how to treat the Fe deficiency.

The Impact of Iron Deficiency on Crop Yield

Iron deficiency can result in poor crop yields and reduced quality. While Fe deficiency affects plant development and growth, excesses can be toxic and equally as harmful. Therefore, tissue samples should be taken to monitor Fe concentration and ensure normal plant development.

The Symptoms of Iron Deficiency in Plants

Iron is immobile in plants, which means that deficiency symptoms will only appear on new leaves. The primary symptom of Fe deficiency is interveinal chlorosis (See Figure). With extreme deficiency, the entire leaf will turn yellow or white, and the leaf margin will burn. It is common for an individual branch or half of a tree to exhibit symptoms while the remainder of the tree looks normal.



Strawberry



Almond



Pepper

Correcting Iron Deficiencies in Your Crops

When inorganic iron fertilizers (i.e., iron sulfate) are added to high pH soils with lime, they are quickly converted to insoluble forms that are unavailable for uptake by plants. Soil-applied chelated Fe fertilizers, like Fe-EDDHA, have been proven to be effective in reducing Fe deficiency in crops. Applying acidic or acid-generating fertilizers with Fe fertilizers (i.e., iron polysaccharide) has also proven to be an effective method of reducing Fe deficiencies. Both approaches are most effective when the fertilizer is applied in a band or run through drip irrigation, where it can be concentrated safely in or near the root zone.

Another method to correct deficiencies is through the foliar application of Fe. This allows crops to take in Fe through the leaves and stomata while bypassing the complex soil chemistry. This approach has been shown to be effective with carbohydrate-complexed Fe products that get taken up by the leaf and translocated to where the Fe is needed in the plant.

Soil applications of iron can be slow to show crop response and may be too late if trees are extremely deficient. Foliar applications must be applied repeatedly, say once a month, to see a benefit. Severe deficiency requires both soil and foliar applications.

If you'd like to learn more about how you can use foliar-applied nutrients to give your plants the nutrients they need, [our team is here to help](#).