Technical Essentials

An introduction to FeEDDHSA

High performance iron chelate

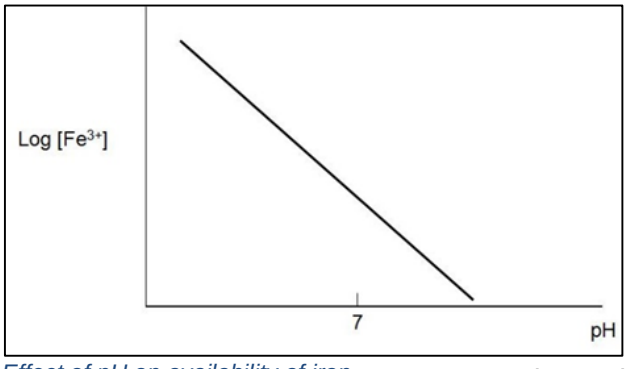
Of all micronutrient disorders in plants iron deficiency is probably of greatest economic importance affecting numerous high value crops growing in strategic areas.

Iron deficiency in orange

Iron chelates are now routinely used to prevent and correct deficiencies and in many cases economic production of crops would be impossible without them.

Iron is an essential micronutrient required for normal growth and plant function. Its key role is in the production of chlorophyll and so crucial for photosynthetic efficiency. Iron is also an important enzyme co-factor in many plant processes.

Lack of iron causes the classical symptoms of interveinal yellowing which in turn lead to losses of yield and produce quality.



Effect of pH on availability of iron.

The availability of iron and the ability for it to be absorbed by plants is largely determined by the pH of the growing medium (in reality the solution that is in immediate contact with roots) and can be described by the chart on the left. Under increasingly alkaline conditions iron becomes less active, being precipitated as insoluble ferric hydroxide which is unavailable for plant uptake. pH is a logarithmic scale so for each unit increase in pH the iron activity is reduced one thousand fold.

Another important factor influencing the availability of iron is the presence of bicarbonate (HCO_3) ions. These occur naturally especially in alkaline water from calcareous sources and

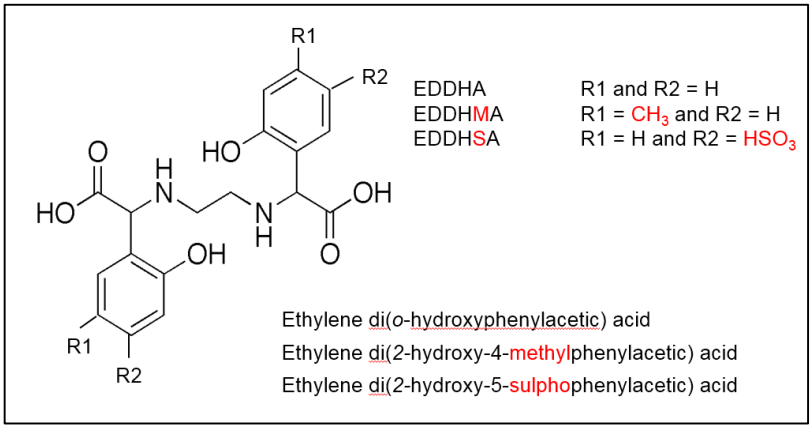
can be neutralised by the use of acids. Bicarbonate ions are and produced by plant root action where each nitrate (NO_3) ion absorbed by the root one bicarbonate ion is released.

Bicarbonate increases (local) pH, interferes with the natural iron chelation, and restricts uptake and translocation of the element by plants. The effect is to exacerbate iron deficiency and its associated problems.

Being so chemically reactive and required in relatively large quantities, iron must be supplied as a chelate. The usual iron chelate for hydroponic/fertigation (inert substrate growing systems) is FeEDTA or FeDTPA.

FeEDDHA, more traditionally associated with the correction of iron deficiency in crops growing in high pH, calcareous soils, is being used more and more in hydroponics/fertigation to overcome special, physiologically induced iron deficiency problems. The reason for this is that FeEDDHA chelate remains stable up to ~pH 10 far beyond anything encountered in the field! But more importantly it is unaffected by bicarbonate or other solution components thereby being able to maintain a supply of biologically available iron to plant roots.

FeEDDHA is one of three related compounds (homologues) differentiated by slight differences in molecular structure as illustrated by the diagram of the ligands, right.

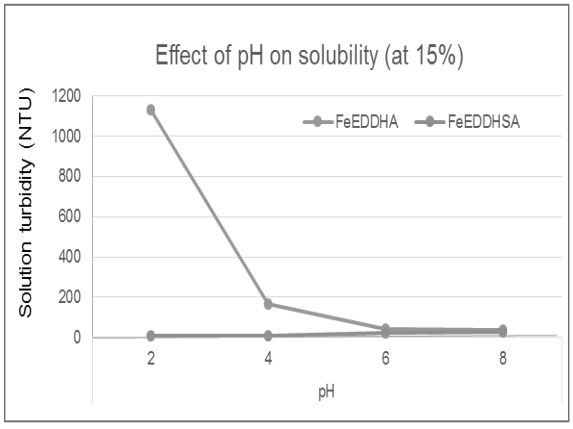


Homologues of FeEDDHA.

FeEDD**H**A is the **h**ydroxy form, FeEDDH**M**A is the **m**ethyl form and FeEDDH**S**A is the **s**ulpho form. Provided the quality of the products based on these compounds is good then from a practical point of view all perform more or less equally in the field. FeEDDHA represent the "workhorse" products with many qualities and formulations widely available. FeEDDHMA products tend to be expensive and limited to specialised applications.

However, FeEDDHSA based products have a better solubility especially at low pH than the other homologues which offers advantages where the material is used to create stock tanks for example.

Investigation work sponsored by Solufeed has quantified the greater solubility of FeEDDHSA compared to FeEDDHA by comparing the solution turbidity, which is a measure of the presence of undissolved solids, at increasing pH levels. The results are summarised by the graph on the right which clearly shows that FeEDDHSA is unaffected by low pH. A full trial report is available upon request.



Effect of pH on FeEDDHA and FeEDDHSA

Solufeed Rapid is a high performance liquid formulation of FeEDDHSA.

Important

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