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FACT SHEET

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Identifying and Correcting Iron Deficiency in Field Crops

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An inadequate supply of available iron causes plants to turn yellow from a lack of chlorophyll in their leaves. Although iron is not part of the chlorophyll molecule, it is required for chlorophyll formation. Iron deficiency symptoms generally appear on younger leaves. Although the symptoms may vary in severity, Table 1 will serve as a guide for the identification of this problem.

Table 1. Deficiency symptoms on major field crops

Crop	Deficiency symptoms
Grain sorghum, corn, forage sorghums and Johnson-grass	Appears on top leaves. Starts as yellow stripes between veins and extends to leaf tips. Young plants may turn pale yellow and under extreme deficiency may develop to bleached white. Often appears only in spots in fields. Plants tend to recover from moderate deficiency.
Oats (small grains)	Leaf blades develop yellow stripes between green veins and continue to turn more yellow over the entire leaf blade of upper leaves.
Soybeans	Development of yellow tissue between veins of young leaves. Under severe deficiency, leaves become pale yellow to white.
Cotton	Pale green or yellow between veins giving a netted appearance and reduced new growth.
Rice	Yellow between leaf veins. Entire leaf blade turns pale yellow.

One of the simplest methods for confirming iron deficiency is to apply a 1 to 2½ percent solution of iron sulfate (copperas) on some chlorotic leaves. This solution may be prepared by dissolving 1 tablespoonful of iron sulfate and ½ teaspoonful of detergent in 1 gallon of water. Apply the solution by spraying, dipping individual leaves in the solution or painting a portion of the chlorotic leaf. Green color should be more noticeable in 4 to 7 days, under favorable growing conditions, if the chlorosis is caused by iron deficiency. Young or recently matured leaves should be used for this test since old, severely chlorotic leaves tend to lack the ability to form chlorophyll, even when supplied with iron.

Iron Deficient Regions

Iron deficiency has been reported in most regions of Texas. The extent of this problem is shown in Figure 1 and generally corresponds to the distribution of alkaline soils. Iron deficiency

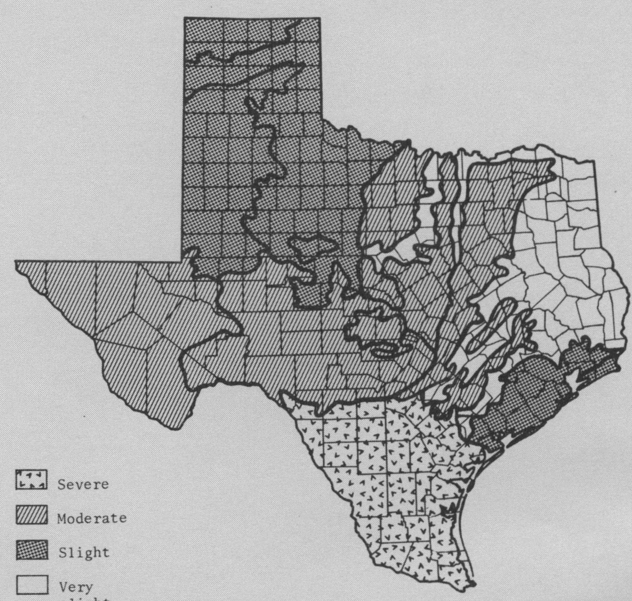

Figure 1. Degree of iron deficiency in land resource areas.

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seldom is observed on crops growing in acid soils. Most soils contain considerable quantities of iron, but the availability is influenced by factors such as pH and calcium level.

Correcting Iron Deficiency

Attempts to correct iron deficiency by applying acidifying materials to calcareous soils generally have not been successful or practical on a field basis, because of the large amount of acidifying material required. For example, it would take 5 tons of sulfuric acid per acre to neutralize 1 percent calcium carbonate in a 6½-inch layer of soil. Many iron-deficient soils contain as much as 10 percent free calcium carbonate, which represents 50 tons of sulfuric acid. If elemental sulfur were used, it would require one-third that amount to give the equivalent acidifying effect. Products of acidifying reactions may increase greatly the soil salinity. Localized acidification through banding or using pelleted sulfur has been successful in some situations.

Applying iron as a foliar spray is the most favorable method for correcting iron deficiency, even though repeat applications may be needed. The low cost of this method is one factor. Iron sprays are most effective when applied on young plants.

Table 2. Sources and rates of iron

Type iron compound	Amount per 50 gallons water	Rate of solution per acre[1]
Iron sulfate (copperas)	10 lb. (2½%)	15 to 30
Chelate	4 lb. (1%)	15 to 30

[1]Wet plants thoroughly.

Iron sprays require a spreader-sticker or detergent in order to be effective. If a commercial spreader-sticker is not available, ordinary household detergent may be used at rates of ¼ to ½ pint per 50 gallons of solution. Thorough coverage and wetting of the entire leaf surface is necessary for good results. Avoid too much detergent to minimize the chances of leaf burn.

Up to three applications may be required at 10-day to 2-week intervals. Table 2 provides a general guide for treating iron deficient plants.

Soil applications of iron compounds, either iron sulfate, chelates or similar formulations generally have not given satisfactory results. If soil conditions are such that iron is in an unavailable form, added iron also appears to quickly become unavailable.

Applications of 250 to 500 pounds per acre of *ferric* sulfate (not copperas) mixed in the soil have improved production of rice in iron-deficient soils.

Summary

To evaluate and correct deficiencies that appear to be caused by iron, follow this guide:

1. Identify the problem through deficiency symptoms and treat chlorotic leaves with an iron solution. Plant analyses are helpful sometimes, but are quite variable and difficult to interpret.

2. If the problem justifies treatment, use foliar sprays containing 2½ percent iron sulfate or 1 percent chelate, and a spreader-sticker.

3. For soils showing extreme and chronic iron deficiency, it may be desirable to grow crops that have a low susceptibility, or plan to spray affected crops as a regular practice.

4. If a mixture of iron sulfate and zinc sulfate is used as a foliar spray, use a concentration of 1½ percent iron sulfate and ¼ percent zinc sulfate.

5. If concentrated solutions of iron compounds are used, be sure that they are diluted properly to the desired concentration for the final solution.

6. The addition of a spreader-sticker or detergent is necessary to obtain even coverage.

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