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Problem: Iron Chlorosis on Trees

Most Susceptible Trees: Pin oak, silver maple, baldcypress, crabapple and sweet gum. Can also affect white pine, elm, London planetree, cottonwood, walnut, sugar maple, Eastern redcedar, Bradford pear and willow.

Description: Affected leaves turn a yellowish color while the leaf veins remain a dark green. Iron chlorosis is caused by the plant not being able to obtain the iron it needs. Iron is needed for the production of chlorophyll. Therefore, a lack of iron results in a loss of the green color in the leaves. In severe cases, leaf color may change from yellow to white to brown. If uncorrected, twigs and eventually branches may die leading to the death of the tree.

Symptoms may appear over the entire tree, on one side only, or be limited to individual branches.

Soils in Kansas usually have adequate amounts of mineral iron. However, as soil pH rises above 7.0, iron changes to an insoluble form that many plants have difficulty picking up.

Recommendations: Iron chlorosis occurs when iron in the soil is either deficient or unavailable to the tree. There are three ways to provide iron to the plant: foliar application, soil treatment, and trunk injection or implantation.

Foliar application.
If a rapid response is needed to correct a chlorotic condition, a foliar spray with iron sulfate or iron chelate solution may be applied when the tree is in full leaf. A rate of five pounds of iron sulfate in 100 gallons of water (2.5 ounces iron sulfate in three gallons water) is recommended. Soybean flour may be added to the solution to help it adhere to the leaves. Adding a tablespoon of detergent will also help to wet the foliage. Iron chelates are water-soluble forms of iron that remain in the solution once added to the soil or tree. Follow label instructions for determining the proper concentration when applying chelated iron directly to foliage. When applying either iron sulfate or iron chelate, it is best to spray during the evening or during periods of cool weather.

Although a foliar spray produces quick results, the improvement is temporary because iron will not move into the tree beyond the tissue that was sprayed. New growth emerging after the treatment will be chlorotic.

Soil treatment.
Lowering the soil pH is a more permanent way of correcting iron chlorosis caused by high pH soils. Unfortunately, this is also one of the most difficult treatment methods because it is almost impossible to lower the soil pH significantly to depths of 18 to 24 inches.

A more feasible approach is to add iron to the soil in sufficient quantity to increase the amount available to tree roots. In bare soils, iron sulfate can be applied to the ground under the tree canopy at a rate of one pound per half inch of trunk diameter measured 4½ feet above the ground. Trees growing in turf-covered soil should be deep-fed either by liquid injection with a hydraulic sprayer or by iron sulfate placed in holes drilled into the soil.

Drill holes spaced two feet apart and 15 to 18 inches deep should form concentric circles around the tree, beginning two to three feet from the trunk and extending beyond the ends of the branches about three feet. This treatment remains effective for two to three years. Chelated iron may be used, but be sure to follow label directions for rates. Best results for the current year will occur when treatment is made in early spring just as buds begin to swell. Also, high pH soils may prevent most iron chelates from working. For any soil with a pH above 7.2, use an iron chelate with EDDHA. Such products include Sequestar 6%, Sprint 138 and Millers FerriPlus.

An alternate soil treatment is to mix sulfur and iron sulfate at a 1:1 ratio. The sulfur lowers the pH in a small area and makes the iron more available to the tree. The recommended rate is one pound of iron sulfate to one pound of sulfur per inch of trunk diameter at 4½ feet above the ground for trees four inches and under. The recommended rate for trees over four inches is two pounds of iron sulfate and sulfur mixture per inch of trunk diameter at 4½ feet above the ground.

Trunk Injection and Implantation.
Trunk injection or implantation: In this method, holes are drilled in the lower trunk and ferric ammonium citrate (iron citrate) is introduced through the holes. Successful applications often last several years. The preferred time of application is during the spring just after the leaves have fully expanded. Use a brad−point drill bit to minimize tree wounding. Research has shown the uptake is enhanced if the holes are drilled in the root flares near the soil surface.

Other Causes of Chlorosis
Iron deficiency is not the only cause of leaf yellowing. Herbicide damage or other mineral deficiencies such as nitrogen, manganese, boron or zinc may also result in chlorosis symptoms. Signs of manganese deficiency, in particular, may be similar to those of iron deficiency. The two can be distinguished by the broad bands of normal green color that remain next to the major veins if manganese is lacking. Leaves on the ends of the branches of manganese-deficient trees generally are not affected until late in the summer after growth has stopped.

In most cases, a foliar application of the deficient mineral early in the summer will cause a temporary green-up of the leaves. If application of the mineral thought to be deficient does not cause a temporary correction of the chlorosis, some other mineral deficiency is causing the problem. Other possible causes should be investigated.

References:
1. Iron Chlorosis in Trees, Kansas State University, Kansas Forest Service Publication, MF-718

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