

Iron Chlorosis in Berries

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Chlorosis is a symptom of iron deficiency common in Utah berry crops. Chlorosis is characterized by interveinal yellowing in mild to moderate forms, with more severe cases resulting in the leaf becoming almost white in color and then curling and browning of leaf edges. While Utah soils typically contain iron, the alkaline pH (> 7.0) makes the iron relatively unavailable to plants.

Several management practices can make iron deficiency more severe.

Fertilization

First, improper application of N-P-K fertilizer can promote iron chlorosis. Nitrogen deficiency can result in slowed growth and leaf yellowing. Applying too much nitrogen will stimulate excessive vegetative growth, which under some conditions will cause the plants to out-run their ability to take up iron. Nitrogen requirements differ between young and old plantings and among soil types, but annual N requirements for established raspberry and strawberry planting are typically 70 to 100 lbs per acre (2.5 to 3.5 oz per 100 sq ft). Likewise, excessive phosphorus can also contribute to iron chlorosis by binding iron with low-soluble phosphate in the soil solution, by competing with iron for root uptake, or by binding up iron with excess phosphates in plant tissues.

Over irrigation

Second, over-irrigation early in the spring will induce iron deficiency, as cold waterlogged roots are not effective at iron uptake. This seems to be the most common cause, particularly on heavy soils. Remember that snow pack and spring rain

will often saturate the soil profile in the spring. Starting your irrigation cycle too early will prolong this waterlogged condition. Allow the soil in the top foot to dry (i.e., a squeezed soil ball crumbles easily upon shaking in hand) before beginning irrigation. The use of equipment for monitoring soil moisture can be an effective method of determining when to begin irrigation. Just because the canal is full, doesn't mean it's time to start watering. For more information on raspberry irrigation see the USU fact sheet "Caneberry Irrigation" available online (extension.usu.edu/publications).



Figure 1. Comparison of healthy (left) and chlorotic (right) raspberry leaves. Note the green veins on the chlorotic leaf.

Is It Really An Iron Deficiency?

Some completely unrelated conditions can mimic iron chlorosis in raspberry plantings and should be ruled out. During several recent seasons in Utah, winter injury produced chlorosis symptoms on floricanes. Some buds were winter killed, while

surviving buds opened slowly and showed leaf yellowing similar to iron chlorosis. This is likely caused by injury to the vascular tissue that slows transport of nutrients to the developing laterals.

Injury from winter applications of the pre-emergent herbicide Princep (simazine) can also cause leaf yellowing that may be confused with iron deficiency symptoms. Follow the label carefully when using this material, giving extra attention to restrictions on use rates, application to young, diseased, or stressed plants, and use on coarse textured (gravelly, sand, and loamy sand) soils.



Figure 2. Chlorosis on a blackberry floricane.

Prevention

Several management actions can prevent or alleviate chlorosis. In theory, one way to prevent chlorosis is to lower the soil pH. This can be accomplished with the addition of organic matter, elemental sulfur, and by using fertilizers that tend to lower soil pH, such as ammonium sulfate. However, sulfur amendments take one or more growing seasons to fully react and lower soil pH and are not effective in the very alkaline soils (pH > 8) common in Utah. Another method is to select varieties that are less susceptible to chlorosis. If you have a site prone to chlorosis, you might experiment with a wide range of varieties to see which of these is less likely to run into problems.

Private crop consultant Dr. Earl Seeley contributed to this fact sheet.

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The authors have commonly seen chlorosis on 'Ruby' and 'Encore' raspberries, and these may be more susceptible than other varieties.

Correcting the Problem

To correct an existing chlorosis problem, consider applying a chelated iron fertilizer. USU Extension recommends the use of an EDDHA-based iron chelate, such as Miller's Ferriplus (Miller Chemical), Sequestrene 138 Fe (Becker Underwood) or similar product (generally designated with the "138" chemical identifier) at a rate of 1 to 2 pounds per acre banded along the row (1/2 tsp per 100 sq ft) and then watered into the soil with at least one inch of irrigation water. Even more effective is to "shank in" the fertilizer to a depth of 2 to 3 inches. The best time for application is in September and May. However, if you notice problems mid-season, you don't have to wait until fall to begin to correct it. A mid-summer application, followed by a September application will go a long way to set up your plants for a better crop next year. For more information on iron chlorosis visit the USU Web site: utahpests.usu.edu/plantdiseases/htm/non-pathogenic/iron.



Figure 3. Chlorosis on strawberry. Note the brown leaf edges on the most severely affected leaf.