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# **D** iagnosing Nutritional & Soil-related Disorders

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## **Diagnosing Nutritional & Soil-related Disorders**

Saskatchewan soils may be considered low in nitrogen and phosphorus relative to the needs of fruit crops. Deficiencies of nitrogen are more common on sandy soils, but also may occur on heavy, wet soils. Acidic, sandy, light soils may be low in potassium. Our soils also have occasional problems with excessive or insufficient calcium or iron. Iron, although present, may not be available to plants on alkaline, or excessively wet soils. Members of the rose family are particularly susceptible to a lack of iron, which is indicated by a yellowing of the foliage (termed iron chlorosis). Magnesium, manganese and boron are only rarely required. Micronutrient deficiencies are uncommon also. If they occur, such deficiencies often first appear on sandy sites.

The most favourable soil pH is between 6 and 7 where all nutrients are easily absorbed by plant roots. At soil pH levels below 6, phosphorus, potassium, sulfur, calcium and magnesium deficiencies can appear. Lime or dolomite amendments are usually required. At soil pH levels above 7.5, iron, manganese, boron, copper or zinc deficiencies might appear. Sulfur amendments may be required.

It is important for growers to monitor

new shoot growth, leaf color and luxuriance, and fruit production and size. Unfertilized saskatoon orchards may begin to show a lack of nitrogen after about 3 years of growth, depending on soil type and adequacy of initial site preparation. Pale leaf color and reduced shoot growth are indicators of nitrogen deficiency.

Symptoms associated with mineral nutrient deficiencies or toxicities are often similar to those produced by disease, insect pests, mechanical injury or climatic conditions. For example, root injury and phosphorus deficiency may cause similar symptoms.

Nutrient deficiencies or toxicities produce symptoms having an even pattern on the plant, either on the oldest plant parts, or the youngest, and on all plants. Insect and disease damage tends to be spotty within and among plants.

Nitrogen, phosphorus, potassium and magnesium deficiencies always first appear on the oldest leaves. Calcium, sulfur, boron, copper and zinc deficiencies start on the youngest, or terminal portions of plants.

Iron, manganese and molybdenum symptoms vary in location, depending on crop species, but often occur first on terminal parts.

Symptoms of toxicity can sometimes appear similar to symptoms of deficiency. The specific symptoms of deficiency or toxicity can vary with crop species. A laboratory analysis of the soil and/or plant tissue is required to confirm a suspected nutritional disorder.

Symptoms characteristic of excess soluble salts in the soil or irrigation water include delayed germination, poor germination, erratic growth of seedlings, lesions of the stem at soil line, seedlings have fallen over, marginal leaf scorch, yellowing of leaves, root discoloration, root dieback, and low survival of transplants.

## **Iron Chlorosis**

### ***Symptoms***

The symptoms of iron chlorosis include yellow leaves with prominent, but narrow, green veins. These symptoms are especially noticeable on young leaves, on suckers and on other new succulent growth (Figures 1, 2 & 3). Younger leaves may be entirely bleached. Leaf margins may be necrotic. If serious, iron chlorosis can cause dieback and even death of the entire plant.

### ***Cause***

On occasion, the saskatoon can suffer iron chlorosis (also referred to as lime-induced chlorosis). An overly alkaline soil (also referred to as high lime, or more commonly, high pH soils), poor soil aeration or drainage, or irrigation water containing excessive quantities of calcium can make iron unavailable to the plants. This affects

the development of chlorophyll causing the characteristic symptoms. The condition must be corrected otherwise it will affect the vigour of the plant.

### ***Control***

In general, iron chlorosis is a very difficult problem to solve. Additionally, it may take some time for the effects of any control measures to become noticeable.

It is important to treat the cause of the problem, that is, reduced availability of micronutrients as a result of high soil pH and/or excess calcium, as opposed to the symptoms of leaf chlorosis. Foliar sprays of iron chelate are only of temporary help.

The orchard soil may be acidified using acidic peat or sulfur. Several applications of peat or elemental sulfur (300 to 500 gm/sq m, or 60 to 100 lbs/1000 sq ft) over two or more years may be necessary to correct the problem. Unfortunately, such applications may work only on sandy soils, or where organic matter content is high.

However, decreasing the pH of the orchard's soil will not necessarily solve the problem. Increased soil aeration and the addition of an iron chelate directly to the soil may be required.

Deep cultivation (greater than 12 inches in depth) close to the plants, every 2 years, may be required to adequately aerate the soil. Soil aeration may be further accomplished in the long run by the addition of more organic matter to the orchard soil. This would require cropping the row alleys with a green manure (oats or vetches for

example) for several years.

The addition of 70 to 140 g/plant of Sequestren 138 Fe (or some other form of Fe EDDHA) at 7 to 14 day intervals during May and June will add iron chelate to the soil.

Iron chlorosis also may result from combined deficiencies of iron and manganese or zinc.

If iron deficiencies are accompanied by zinc deficiencies, the addition of a 0.1 to 0.3% zinc salt to the orchard soil may be required.

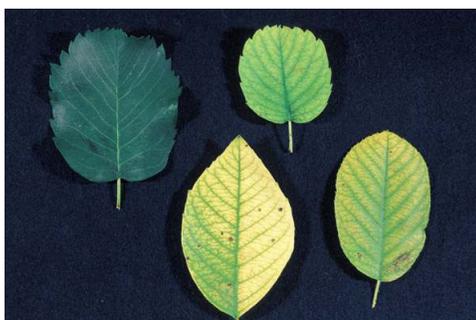
Symptoms of iron deficiency are very similar to symptoms of manganese deficiency, except that the green zone surrounding the leaf veins is wider, and the interveinal areas of the leaf may be necrotic. Consequently, what is diagnosed as an iron deficiency may be a manganese deficiency, or possibly, a moderate deficiency of both nutrients. If the addition of iron, and/or zinc does not reduce the symptoms, a manganese deficiency should be suspected.



**Figure 1.** Saskatoon suckers exhibiting symptoms of iron chlorosis.



**Figure 2.** Saskatoon leaves exhibiting symptoms of iron chlorosis.



**Figure 3.** Saskatoon leaves exhibiting different degrees of symptoms of iron chlorosis.

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