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NUTRIENT DISORDERS IN TREE FRUITS

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NUTRIENT DISORDERS IN TREE FRUITS

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Most severe nutritional problems in tree fruits can be diagnosed by visual symptoms. However, you must be cautious. Many other factors can produce similar-looking disorders. In addition, deficiencies and toxicities do not always look like these pictures. Differences could be due to the degree of severity or to combinations with one or more other factors that influence the growth of the tree.

Before applying nutrients or taking other steps to correct a disorder, be sure of the diagnosis. Soil tests or tissue tests are often valuable in confirming the visual evidence.

DEFICIENCIES

BORON

The first signs of boron deficiency usually appear in the fruit. Foliage or growth symptoms appear later and indicate a more serious shortage.

Fruit

The effects of boron deficiency on fruit are similar in apples, pears, and apricots. The most common is cork development. The tissue becomes dry and withered. If this occurs while the fruit is small, growth will be slowed and the fruit will fail to size.

If the cells in the skin are injured because boron was inadequate, a rough, scabby skin will develop (Fig. 1). However, the fruit may crack without showing noticeable cork. This is especially true of apricots (Fig. 2). Such cracks may appear anywhere on the surface of the fruit—cracks that occur only in the suture of apricots are not necessarily due to a boron deficiency. The deficiency may also cause deformed fruit, especially on apples (Fig. 3).

Foliage and Growth

More severe deficiency may be indicated by such foliage and growth symptoms as dieback, withered blossoms, rosettes, deformed leaves, bark disorders, or refusal to grow.

Boron deficiency is probably observed most often in the early spring. It is characterized by fruit and leaf buds failing to break dormancy, followed by death and dying back of the branch (Fig. 4). This dieback can be distinguished from winter injury by examining the cambium layer of the bark. With boron deficiency, the cambium is white. With winter injury, the cambium is discolored.

Apple trees suffering from acute boron deficiency develop a whorl of small leaves at the end of the shoot. These may be typical rosettes, or the boron may be exhausted more slowly, with the leaf size steadily getting smaller (Fig. 6). On Delicious, lack of boron can also cause blisters or "measles" in the bark of the trunk and branches.

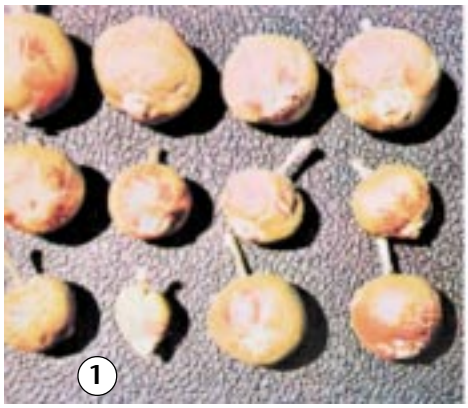

FIG. 1—Young McIntosh apples develop a "russet" which frequently cracks. The fruits do not recover.

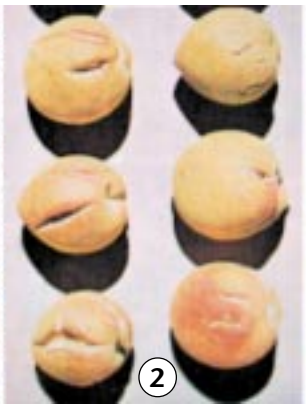

FIG. 2—Cracking of apricots due to boron deficiency. There may not be much corky tissue present.

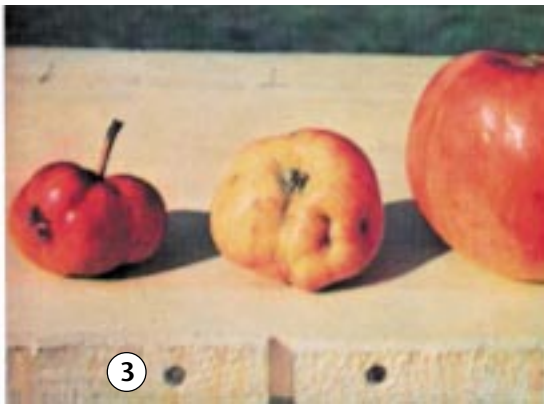

FIG. 3—Boron deficiency can cause deformities in apples. There may be little cracking or cork. The fruit fails to develop or size normally.

Pear trees seldom develop rosettes. Instead, they merely form a terminal bud and fail to grow.

A common symptom in pears is blossom blasting (Fig. 5). Some of the flower-bearing spurs begin growth normally, but wither after bloom. On severely affected trees, all of the blossoms wither and some of the shoots may wither, too. Blossom blasting may also occasionally be seen in apples.

Italian prune and sweet cherry have similar boron deficiency symptoms. The leaves are small, narrow, and pinched at the base (Fig. 7). They have an enlarged midrib and a glossy surface. The shoots are short and thin. They are often leafless and have green bark. They may die by late summer. Blossoms are absent—or nearly so—and may be deformed.

IRON

Leaves of iron-deficient trees are yellow with a fine network of green veins (Fig. 8). In severe cases, all the green is lacking and dead tissue may develop around the edges and sometimes within the body of the leaf. All or part of the tree may be affected (Fig. 9).

Iron deficiency occurs in trees growing on alkaline soils and is usually more severe when too much water has been applied or when soil aeration is poor

FIG. 4—Boron deficiency is most easily recognized in early spring. Here an entire row of pear trees has failed to break dormancy.

FIG. 5—Blossom blast. Shortly after the bud blooms, it wilts and dies. This is typical of boron deficiency in pear.

FIG. 6—Severe boron deficiency on apple. Note whorl at end of shoot.

FIG. 7—On Italian prune, boron-deficient leaves are small, narrow, and constricted at the base. The midrib is usually enlarged.

because of a high water table or a tight subsoil. An application of nitrogen fertilizer may increase the yellow chlorosis.

MANGANESE

Manganese deficiency is also indicated by yellow leaves. Usually only older leaves are affected (Fig. 10). The veins, and the tissues next to the veins, stay green. The yellowing is more pronounced as the deficiency becomes more severe. When it is very severe, young leaves may also be affected.

Like iron deficiency, manganese deficiency occurs on alkaline soils, but it is not more severe on wet or poorly drained soils. It does not occur as often as iron deficiency.

COPPER

Copper deficiency, also called "wither tip," occurs in apple and pear trees. The shoots grow normally early in the season, but in mid-June the terminal leaves turn yellow, wither, and fall (Fig. 11). Twigs with dead and withered tips occur over part or most of the tree.

FIG. 8—Iron-deficient peach leaves are yellow with a fine network of green veins. Leaf at left is normal.

FIG. 9—Iron-deficient pear trees between healthy trees. On the most severely affected parts, the leaves have dead areas and there is some die back.

FIG. 10—Manganese-deficient peach leaves have green veins, but yellow tissue between the veins. Older leaves are affected first.

FIG. 11—Copper deficiency causes terminal leaves to turn yellow, wither, and fall. The shoot may also die back.

ZINC

Zinc deficiency occurs in most orchard areas in the Pacific Northwest. It is often called "rosette" or "little leaf" because of the characteristic symptoms.

Rosettes form when the distance between the leaves on the shoots is greatly shortened. Or, in the case of little leaf, the spacing of the leaves can be normal, but the size is much smaller than usual. These symptoms can affect all shoots on a tree or only some of them (Figs. 12, 13, and 14).

Yellowing or chlorosis of the leaves is also a sign of zinc deficiency, particularly on stone fruits. On slightly deficient trees, the leaves may be partly yellow but normal in size. On very deficient trees, they will be completely yellow, dwarfed, and narrower than normal (Fig. 15).

MAGNESIUM

Magnesium deficiency is a problem only on apple. Symptoms vary from variety to variety and orchard to orchard. Yellow areas develop between

FIG. 12—Zinc deficiency in pear. Many buds have failed to open. In others, the leaves have opened, but are small and yellow.

FIG. 13—Zinc deficiency in cherry. This picture was taken in mid-summer and shows typical rosettes and small, yellow leaves.

FIG. 14—Zinc deficiency in apple. Little leaves and rosettes at the end of the shoots are typical.

FIG. 15—Increasingly severe zinc deficiency in apricot leaves. Both color and size are affected.

the veins or along the edges of older leaves in late summer (Fig. 16). These areas may die and turn brown (Fig. 17). Many of the affected leaves drop prematurely. Seriously deficient trees may lose more than half their leaves by harvest time and the fruits do not attain marketable size.

Winesap, Newtown, and Golden Delicious are usually more seriously affected than Delicious. Trees with a heavy crop are affected most.

SULFUR

Sulfur deficiency causes poor growth and pronounced yellowing of the leaves (Figs. 18 and 19).

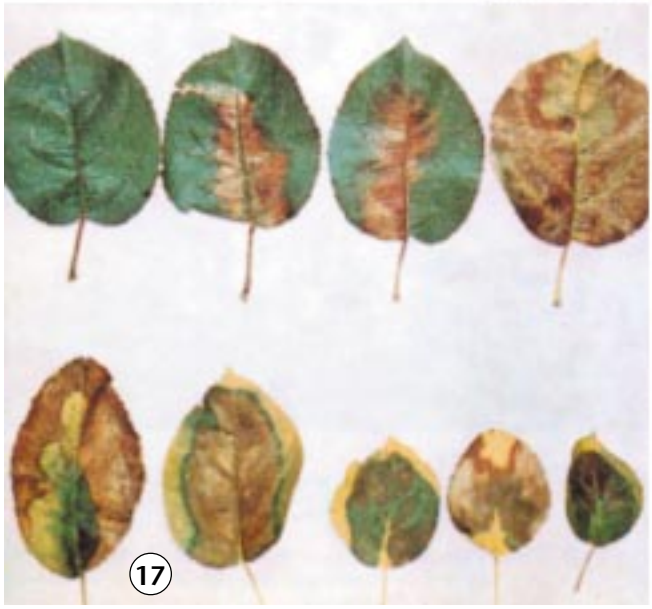

FIG. 16—Magnesium deficiency on Delicious apple. This condition usually appears in late summer.

FIG. 17—Magnesium deficiency often produces highly colored leaves. Either the edges or the internal portions may be affected.

FIG. 18—Sulfur-deficiency in pear. Leaves are a pronounced yellow. The green trees in the background were treated with ammonium sulfate.

FIG. 19—Sulfur-deficient pear leaves. The leaves are uniformly yellow and the color is more intense than with nitrogen deficiency.

The yellowing is more intense than with nitrogen deficiency, but otherwise the symptoms are similar.

NITROGEN

The leaves of nitrogen-deficient trees are smaller than normal and pale green (Fig. 20). The shoots are frequently shorter and the bark may have a reddish tinge. Growth is restricted, fruit size is reduced, and production is poor. Fruit color, however, is enhanced.

On peach, severe deficiency causes reddish leaves. Dead spots may form in the leaves and fall out, causing a mild "shot hole" condition (Fig. 21).

POTASSIUM

Potassium deficiency can be a problem on all tree fruits. In Comice pear, it causes purplish browning of the edges in spur leaves (Fig. 22).

The deficiency can be found on all types of soils. However, it is most often associated with poorly drained, fine-textured soils.

TOXICITIES

ARSENIC

Arsenic toxicity occurs on land that was in apples or pears during the lead arsenate spray era.

It is characterized by poor growth in all types of young trees. In peaches and apricots, red spots appear along the edges of the leaves and between the veins during hot weather. The tissue in these spots dies and falls out, leaving a "shot hole" condition. The leaves also have ragged edges (Fig. 23). After more arsenic accumulates in the leaves, they drop prematurely (Fig. 24). Peach is particularly likely to exhibit these symptoms.

MANGANESE

"Apple measles," a bark disorder, is caused by an excessive accumulation of manganese. It affects the trunks and branches of the trees (Fig. 25).

This symptom is found only on Delicious. Golden Delicious and other varieties are not affected, although they may be unthrifty when they grow under the same conditions that produce measles on Delicious.

The disorder occurs only when the soil becomes strongly acid (below pH 5), causing too much manganese to accumulate in the bark.

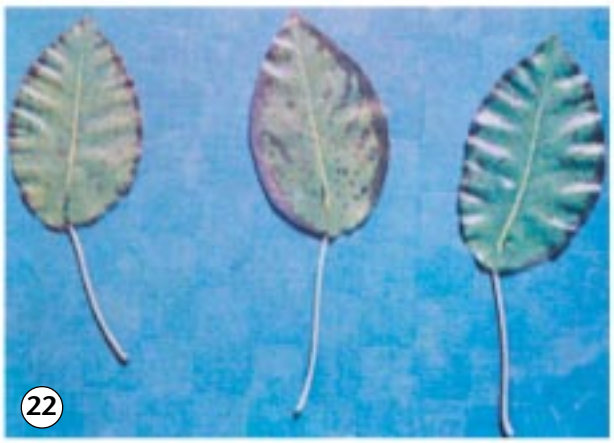

FIG. 20—The pale green tree is nitrogen deficient. It is smaller than trees of the same age and does not produce as well.

FIG. 21—Nitrogen-deficient peach leaves. The reddish brown spots may drop out, leaving a "shot hole" condition.

FIG. 22—Browning of the edges and black dead areas on Comice pear leaves are caused by potassium deficiency.

BORON

Too much boron can cause injury to all fruit trees, especially young trees planted in light or sandy soil. Oozing of sap or gum is a common symptom when the toxicity is severe, and so is dieback.

In peach, mild toxicity is indicated by spots of dead tissue along the leaf midrib (Fig. 26). The spots may drop out, leaving holes along the midrib.

FIG. 23—Arsenic toxicity in peach causes red spots along the leaf edges and between the veins. These spots may drop out.

FIG. 24—When arsenic toxicity is severe, particularly in peach, the affected leaves fall prematurely, leaving many small, undeveloped fruits.

FIG. 25—Apple measles on Delicious is caused by manganese toxicity. A similar bark condition is caused by boron deficiency.

FIG. 26—Too much boron causes browning and dead spots along the midrib of peach leaves.

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