Diseases, Deficiencies, and Toxicities in Plants

Part 1: Knowing how to identify the problem.

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DISEASES

Beet Western Yellow Virus

Beet western yellow virus - Causes yellowing of the leaves, chlorosis of older leaves, interveinal chlorosis, and leaf brittleness. Leaves will also roll and thicken.

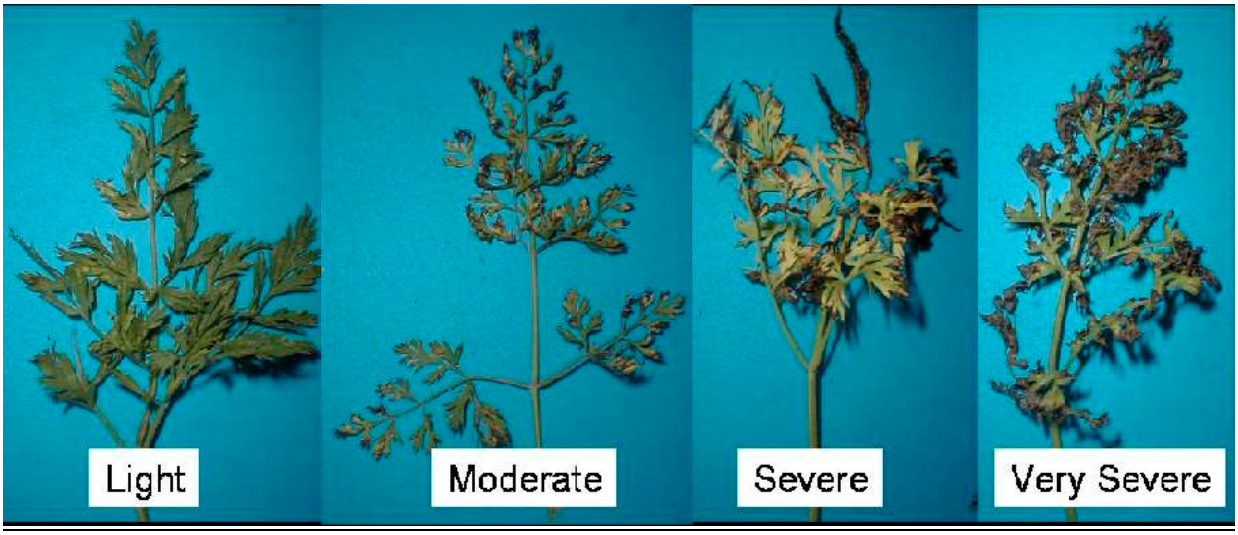
Bottom Rot

Bottom Rot – The rotting of the lower leaves that touch the ground. Other signs are rust colored sunken spots on the petioles and midribs. As the disease spreads the lesions get worse. This disease gets worse in warm moist weather.

Brown Stain

Brown stain – Brown spots will begin to appear on the midrib. This is caused by the storage of excess CO2.

Brown Rib/ Rib Blight



Brown rib/ rib blight – the cause of brown rib/blight is unknown, but is more prevalent in higher temperatures.

Crown Head / Grey Mold

Crown head / grey mold – occurs in cooler weather. Symptoms are slime, brown spots, and grey spores. Standing water on the leaves is necessary for this type of infection to occur.

Damping Off

Damping off – Caused by soggy field conditions. Symptoms include root rot and collapsed plants.

Downy Mildew

Downey Mildew – occurs in moist conditions. Symptoms are drastically discolored areas of the veins. On these discolorations is where the white mold will appear if left alone long enough. Free sanding water is necessary for this fungus to survive.

Drop

Drop – Occurs in cooler moist conditions. Signs of drop are white lesions, necrosis, and a peeling back of leaves from the bottom up with the central stalk more or less intact until the very end of the plants life.

Tip Burn

Tip Burn – Caused by calcium deficiency. Develops in warm weather and fast growing conditions, greater incidences occur when the weather is 85°F of higher on average and a minimum temperature of 55°F. initial symptoms effect the inner leaves. Small translucent spots appear close to the leaf margins. The lesions darken and the leaf tissue dies.

Soft Rot

Soft Rot – Symptoms include leaf wilting and light brown to red discoloration of the midrib.

Lettuce Mosaic Virus

Lettuce mosaic virus (LMV) – 1. LMV (lettuce Mosaic Virus) can be seed borne as well as crop borne in lettuce. Infection of seedlings normally stay around the 1% - 4% infection of the crop, but may result in 50% yield loss and possibly up to 100% crop loss in certain weather conditions. Seedlings with the infection suffer from misshapen cotyledons. The first true leaves are misshapen and dark green and wilting looking. These plants remain stunted and fail to form heads.

2. Field borne symptoms appear 10-15 days after the initial infection. The symptoms include vein clearing, mosaic like discoloration, yellowing, stunting, distortion, internal necrosis, and failure to head. Affected leaves often fall backward and show tears or breaks in the leaves. Primary spreading in the field is caused by aphids and other small insects like white flies, caterpillars, cut worms, and slugs. Mechanical spread, or the spread from one leaf touching another, is also a way for the disease to be transferred from one plant to the next. Seed borne infectivity is only 1-4%. Crop losses ranges from 20% in cool spring like weather to 100% crop loss in summer like weather conditions. LMV infects over 12 plant families. Controls include using MTO seeds (mosaic tested zero = 0:30,000). The use of certified seeds has essentially eliminated lettuce mosaic virus in Hawaii.

Pink Rib

Pink Rib – occurs on older heads of lettuce. Symptoms get worse during the shipping process. Symptoms are a diffuse pink color at the midrib base where it connects to the stem of the lettuce..

Russet Spotting

Russet Spotting – small oval shaped brown spots on the midribs of the outer leaves.

Tomato Spotted Wilt Virus

Tomato Spotted Wilt Virus (TSWV) – numerous tiny spots on the younger leaves and stunted plants that fail to head and then begin to rot. Symptoms also include downward leaf curling and extensive necrosis. It takes one to two weeks to go from initial symptoms to plant collapse. Devastation can reach 100% between transplant to harvest. Virus is transmitted by Thrips and in a constant manner (constant increase if left unchecked). The virus can also be spread mechanically through leaf contact.

Deficiencies

Iron Deficiency

Symptoms show some yellowing of the leaves at the base with some green veinal coloration. Commonly the youngest leaves start out turning yellow and progressively get worse until the entire leave is bleached. The bleached areas often develop necrotic spots. Right up to the point where the leaves turn completely white the leaves will recover if Iron is introduced into the system. When the recovery begins the first signs begin to show at the veins of the leaves begin to regain their green color. Because iron has a low mobility, iron deficiency symptoms appear first on the youngest leaves. Iron deficiency is often related to anaerobic conditions of the soil and the existence of heavy metals.

Magnesium Deficiency

In its advanced form, magnesium deficiency may resemble potassium deficiency. Magnesium deficiency normally begins with the rotting of the interveinal tissues of the leaves. The interveinal tissue expands more than the other leaf tissues, producing a raised blister like surface, with the top of the blisters progressively going from chlorotic to necrotic tissue, in some plants such as the Brassica .

Calcium Deficiency

These calcium-deficient leaves (see Figure 9) show necrosis around the base of the leaves. The very low mobility of calcium is a major factor determining the expression of calcium deficiency symptoms in plants. Classic symptoms of calcium deficiency include blossom-end rot of tomato (burning of the end part of tomato fruits), tip burn of lettuce, blackheart of celery and death of the growing regions in many plants. All these plants show soft dead necrotic tissue at rapidly growing areas, which is generally related to poor translocation of calcium to the tissue rather than a low external supply of calcium. Very slow growing plants with a deficient supply of calcium may re-translocate sufficient calcium from older leaves to maintain growth with only a marginal chlorosis of the leaves. This ultimately results in the margins of the leaves growing more slowly than the rest of the leaf, causing the leaf to cup downward. This symptom often progresses to the point where the petioles develop but the leaves do not, leaving only a dark bit of necrotic tissue at the top of each petiole. Plants under chronic calcium deficiency have a much greater tendency to wilt than non-stressed plants.

Sulfur Deficiency

This leaf shows a general overall chlorosis while still retaining some green color. The veins and petioles show a very distinct reddish color. The visual symptoms of sulfur deficiency are very similar to the chlorosis found in nitrogen deficiency. However, in sulfur deficiency the yellowing is much more uniform over the entire plant including young leaves. The reddish color often found on the underside of the leaves and the petioles has a more pinkish tone and is much less vivid than that found in nitrogen deficiency. With advanced sulfur deficiency brown lesions and/or necrotic spots often develop along the petiole, and the leaves tend to become more erect and often twisted and brittle.

Nitrogen Deficiency

As the deficiency progresses these older leaves become more and more yellow (chlorotic). The leaves will reach an almost white color is the deficiency is left unchecked long enough. Branching is reduced in nitrogen deficient plants which results in short, whip like plants. The yellowing in nitrogen deficiency is uniform over the entire leaf including the veins. Recovery of deficient plants is immediate (days) and spectacular when nitrogen is applied to the system.

Potassium Deficiency

Some of these leaves show necrosis at the edges of the leaves (tip burn), In more advanced stages of deficiency necrosis appears in between the veins and then develops into general necrosis of the entire leaf.

Phosphorous Deficiency

Phosphorus deficiency symptoms aren't very easy to identify. Some of the more major symptoms are dwarfed plant growth and development slower than the surrounding plants. Certain plant species will show signs of phosphorus deficiency when their stems turn reddish purple in color.

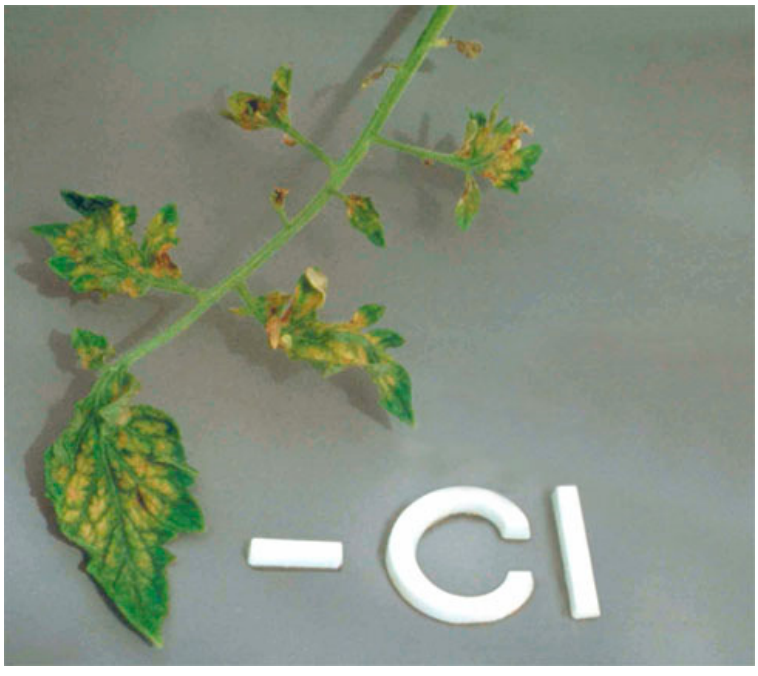
Manganese Deficiency

Early stages of Manganese deficiency resemble Iron deficient plants. A light chlorosis will begin on the younger leaves of the plant, and will develop netted veins at the plant matures. And the deficiency gets worse the leaves will develop and grayish glare to them, and dark spots will appear.

Boron Deficiency

Boron deficiency is usually characterized by a general yellowing of the plant leaf. These symptoms will resemble calcium deficient plants greatly. Boron deficient leaves will be brittle and exude and syrupy liquid from the leaves. The boron deficient leaves suffer from a difficulty to transport water throughout the leaves even though water may be in abundance

Chloride Deficiency



The shape of chloride deficient leaves will be abnormal. The most common symptoms are chlorosis of the leaves and wilting in the younger leaves.

Molybdenum deficiency

An early stage of Molybdenum deficiency is a general yellowing of the entire leaf, which will look like a nitrogen deficiency. The initial stages of molybdenum deficiency are in fact caused by a deficiency of nitrogen in the plant, but the symptom will remain if nitrogen is added to the system. A main symptom of molybdenum is an upward cupping of the leaves and necrotic spots will appear if the deficiency reaches terminal status.

Zinc Deficiency

younger leaves will become yellow and start to pit on the mature leaves. As the deficiency gets worse necrosis begins in the smaller veins of the leaves but the main veins remain green, just like recovering iron deficient plants.

TOXICITIES

Iron Toxicity

Iron toxicity is normally pH related. It occurs when the pH drops to allow massive amounts of iron into the plant. Excess Iron occurs when Zinc is deficient, so the symptoms will look like a deficiency of zinc. Symptoms will include darker green leaves and stunted growth.

Magnesium Toxicity

No visual effects of Magnesium Toxicity.

Before the toxicity level of Magnesium is reached a Potassium deficiency will occur.

Calcium Toxicity

No visual effects of Calcium Toxicity.

High levels of calcium rarely harm plant growth, although the excess of calcium carbonate in the soil may result in a higher pH level complication.

Sulfur Toxicity

No visual effects of Sulfur Toxicity.

Sulfur toxicity for practical purposes should be considered as non-existent. Excessive applications most often result in a depression of soil pH and an increase of the problems that occur with the pH decrease. In fact, sulfur uptake is reduced as the pH of the soil decreases.

Nitrogen Toxicity

Nitrogen toxicities are tricky. The first stages look like the plant is doing really well. The leaves are thicker and more abundant on the plant. But if the excess is severe, the leaves will turn brittle and crack, the root system will begin to rot, and the plant will fail to flower and fruit.

Potassium Toxicity

Potassium toxicity looks like phosphorus toxicity, The main difference is that too much potassium also causes root loss and the wilting of younger leaves.

Phosphorous Toxicity

Phosphorus toxicity shows the same symptoms of nutrient deficiencies copper, iron and zinc. The leaves begin to turn yellow even though the ribs will remain green. Leaves will be smaller in length but will generally be thicker.

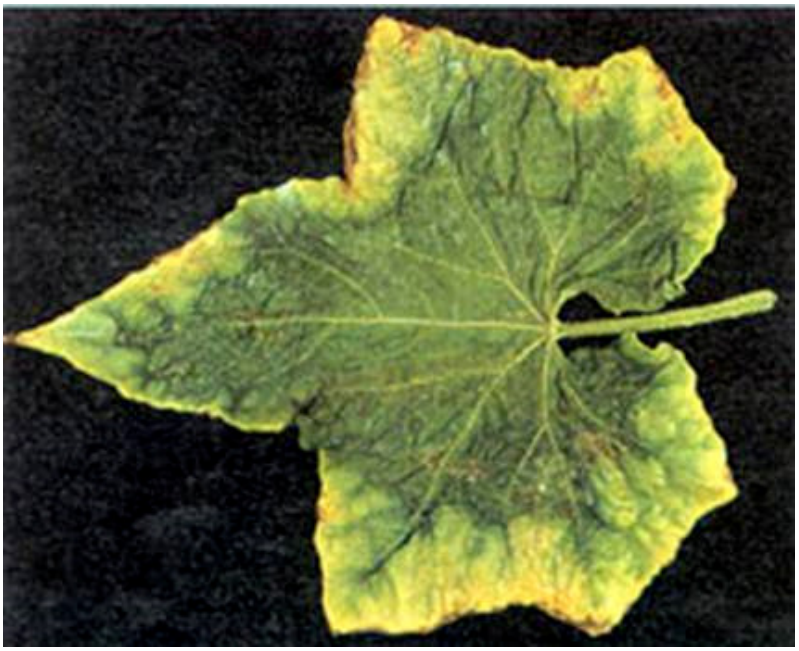
Manganese Toxicity

There are two types of symptoms of Manganese toxicity. One is the darkening of the leaf veins and the second is interveinal chlorosis .

Boron toxicity

Tips and edges of leaves show necrotic spots merging into scorched edges of the leaves, which will look like severe tip burn. The oldest leaves will be affected first.

Chloride toxicity



The general plant growth will be stunted and the leaves will look dry and brittle.

Molybdenum toxicity

No visual effects of Molybdenum Toxicity.

No record of Molybdenum toxicity in plants.

Zinc Toxicity

The symptoms of Zinc toxicity will look like an Iron deficiency. The leaves will turn yellow in between the veins and the veins will start to become necrotic over time. The plant growth overall will be stunted.