Nutrient Deficiency Symptoms and Remedies

Nutrient (Function)	Deficiency symptoms	Excess / Toxicity symptoms	Remedies
Nitrogen (Necessary for chlorophyll and genetic material (DNA & RNA) formation; stimulates green, leafy growth)	Little new growth, yellow leaves: this being more pronounced in older leaves. Earlier fall leaf drop. New shoots may be red to red-brown. Plant development gradually slows down. Gradual drying, beginning at leaf margins, of the area between the lower leaf veins. The petioles bend and hang downwards, parallel to the stem. The plant develops few flowers and fruit setting is poor. The fruit receptacle is thin, and the ovary is small. Sometimes there is no fruit development on the plant at all, and on those plants that bear fruits, the fruit is deformed. 	Plants are usually dark green in color, have abundant foliage, but usually with a restricted root system. Flowering and seed production can be retarded.	Quick fix: Make weekly foliar applications of fish emulsion or manure tea. Long term: Apply aged compost, manure, soybean meal or cottonseed meal to the soil once in spring. Seaweed extract will improve the soil environment thus giving nitrogen fixing bacteria a boost.
Phosphorus (Necessary for genetic material (DNA & RNA) formation; stimulates fruit, flower and root production, and early season growth; increases disease resistance)	The plants display limited growth. The leaves are hard and brittle to the touch. Flower formation is defective. Few flowers develop, and in those that do develop, only one in every four or five develops a fruit. The fruit is underdeveloped, with a thin receptacle, and very few seeds. The root system is undeveloped. Overall dark green with purple, blue or reddish cast to leaves particularly on underside, veins and stems and some plants respond to lack of P with yellowing. Foliage may be sparse, small and distorted becoming mottled and bronzy with maturity. Very distinctive symptoms. Excess foliage with no flowers can also indicate lack of (P).  	No typical primary symptoms. Copper and zinc deficiencies may occur due to excessive phosphorus.	Quick fix: Spray plant weekly with fish emulsion until symptoms quit. Apply a light soil dressing of wood ashes. Incorporate aged compost into the soil to boost microorganisms. Long term: Mix rock phosphate or aged manure into the soil in fall.

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Potassium (Potash K - Associated with movement of water, nutrients, and carbohydrates in plant tissue. Stimulates early growth. Helps in the building of protein, photosynthesis, fruit quality and reduction of diseases.)	Sickly looking plants, undersized fruits, leaves showing marginal and interveinal yellowing. Yellowing starts on older leaves and progresses upwards. Leaves may crinkle, turn brown and roll upwards. Blossoms may be distorted and small. Plant has little resistance to heat, cold and disease problems. Yellow chlorosis spots appear between leaf veins, firstly in the lower leaves. The veins and the areas adjacent to these spots do not change their color. Later, the chlorotic spots become lighter. (This can be seen mainly in the upper parts of the plant). There is little fruit setting, and not much fruit, which is smaller than usual. 	Usually not excessively absorbed by plants. Excessive potassium may lead to magnesium, manganese, zinc or iron deficiencies.	Potash deficiency is mostly in the upper levels of soil. Quick fix: Spray plant weekly with fish emulsion until symptoms quit. Long term: Apply seaweed, manure, granite dust or greensand to the soil in fall. Hardwood ashes may be applied to soil anytime.
Sulfur (Aids in formation of certain oil compounds that give specific odors to some plants such as onions, garlic, mustard, etc; increases oil production in flax and soy beans)	Leaves are pale yellow-green at any stage of development. Shoots are stunted. Similar to chlorosis. Causes leaves to become yellowish. 	Reduction in growth and leaf size. Leaf symptoms often absent or poorly defined. Sometimes interveinal yellowing or leaf burning.	Perform soil test. Add sulfur or potassium sulfate as necessary. Use caution when applying sulfur compounds, however. Too much sulfur ("sulfur toxicity") appears as veinal chlorosis followed by rapid defoliation of the lower leaves.

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Magnesium (Aids in chlorophyll formation and energy metabolism; it increases oil production in flax and soy beans; helps regulate uptake of other elements. It also promotes healthy, disease-resistant plants. It is generally available in acidic soils)	Is Common on pepper plants. Yellowing of the leaves is apparent in the interveinal areas and veins remain green. The oldest leaves are affected first. Sometimes magnesium deficiency occurs when excessive applications of potassium have been made. It may also show up under extremely hot dry weather. A lack of magnesium is characterized almost identically with iron deficiency but the older leaves, generally at the bottom of the plant, show marginal and interveinal reddening or yellowing with leaf base and midrib staying green. Later in the season interveinal necrosis may occur. Leaves may be brittle and thin with leaf curling and stunted growth.. Apples may drop prematurely. In the fall as temperatures cool plants are unable to take up Mg and leaves will turn a purple color. 	Very little information available.	Epsom salts (magnesium sulfate) can be used for magnesium deficiency. You can use it watering with a mix of 1-2 teaspoons or Epsom salts dissolved in 1 gallon of water or using the mix as foliar spray. Make 3 applications 6 weeks apart. Other treatments include adding fish meal, basic slag, greensand or dolomitic limestone.
Calcium (Raises soil pH; promotes root hair formation and early growth)	The most common reason for Blossom End Rot of the fruit. This may be corrected by foliar spray of calcium chloride or calcium nitrate. Further information following downwards. Young leaves are small and distorted with curled back leaf tips. Shoots may be stunted and show some dieback, roots will be stunted.  	No consistent visible symptoms. Usually associated with excessive soil carbonate.	This may be corrected by foliar spray of calcium chloride or calcium nitrate.

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Iron (Stimulates the formation of chlorophyll and helps oxidize sugar for energy; also necessary for legume nitrogen fixation. It regulates the respiration of the plant's cells)	Symptoms show at the later stages of growth. The young leaves fade and then become yellow in the areas between the veins. The veins remain green. New leaves are the most symptomatic and when condition is most severe they can be all yellow or white but still have green veins. Overall you see yellow leaves with green veins leading to marginal scorching or browning of leaf tips. Tip leaves, especially basal areas of leaflets, intense chlorotic mottling; stem near tip also yellow. Fruits have poor color. Shoot diameter is small. Iron deficit often occurs when the soil pH is higher than 7.5 meaning it is more alkaline. Lack of Fe is common in plants living next to concrete walls, foundations etc. 	Rarely evident in natural conditions. Has been observed after foliar iron sprays manifested as necrotic spots.	Perform a soil test; correct soil pH to 7.0 or lower. In iron-deficient soils, add bone meal or blood meal organic amendments, or add iron sulfate or chelated iron liquid or granular inorganic amendments. Quick fix: Apply chelated iron directly to soil or as a foliar spray. Long term: Improve the soil by adding 1-2 inches of compost in the spring every year.
Chloride (Needed for photosynthesis; stimulates root growth and aids water circulation in plants)	Wilted leaves, which then become chlorotic bronze, and necrotic. Roots become stunted and thickened near tips.	Burning or firing of leaf tips or margins. Bronzing, yellowing and leaf abscission and sometimes chlorosis. Reduced leaf size and lower growth rate.	
Manganese (Necessary for the formation of chlorophyll)	Chlorotic spots between the upper leaf veins. Similar to N deficiency, leaves display marginal scorching, rolling and reduced width. Yellowing may also occur between leaf veins or total yellowing on youngest leaves. 	Sometimes chlorosis, uneven chlorophyll distribution. Reduction in growth. Lesions and leaf shedding may develop later.	Perform a soil pH test; correct to 6.5 or lower. In deficient soils, add millorganite or houorganite treated sludge organic amendments, or add manganese sulfate inorganic amendments.

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Boron (Stimulates cell division, flower formation and pollination)	The deficiency manifests itself very quickly. The lower leaves curl upwards. Growth is stunted. The plant develops a thick, short stem. The apex withers and the leaves become yellow from bottom to top of the plant. There is a reduced production of flowers, and fruit setting is poor. Youngest leaves may be red, bronze or scorched also small, thick or brittle. New shoot tips may form what is called a witches broom. Stems stiff; terminal buds die and growths die back; lateral shoots developed, giving plant flat top; leaves highly tinted purple, brown and yellow. Fruit and vegetables may have heart rot. Fruits pitted and corky areas in skin; ripening is uneven. Boron deficiencies are found mainly in acid, sandy soils in regions of high rainfall, and those with low soil organic matter. Borate ions are mobile in soil and can be leached from the root zone. Boron deficiencies are more pronounced during drought periods when root activity is restricted. Boron deficiency; the growing points die and decay, and the leaves are misshapen:  		Apply household borax at a rate 1 tablespoon borax to 12 quarts of water. This amount will treat a 100 foot row of vegetables or 10 square feet of soil. Apply two times 2-3 weeks apart.
	Boron excess:  	Yellowing of leaf tip followed by progressive necrosis of the leaf beginning at tip or margins and proceeding toward midrib.	

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Zinc (Stimulates stem growth and flower bud formation)	Zinc deficiencies are mainly found on sandy soils low in organic matter and on organic soils. Zinc deficiencies occur more often during cold, wet spring weather. New and intermediate leaves are small, yellow, sometimes with a grayish cast. Narrow and older leaves may drop. Small shoots may show rosetting followed by dieback. The leaves become narrow and small in chili.  	Excessive zinc commonly produces iron chlorosis in plants.	Use fertilizers that generate acidity. Organic compounds such as zinc chelates (zinc EDTA and zinc NTA) are about 5 times more effective than inorganic salts with equivalent amounts of zinc. Test the soil for a pH Imbalance, making sure that the pH is between 5.8 and 6.2. A pH imbalance can inhibit the absorption of zinc and other nutrients.
Copper (Stimulates stem development and pigment formation)	Appear late in the vegetative stage. The leaf margins curl and dry up. The leaves and the fruit become narrow and rectangular. Copper deficiencies are mainly seen on sandy soils which are low in organic matter. Copper uptake decreases as soil pH increases. Increased phosphorus and iron availability in soils decreases copper uptake by plants. Small leaves with necrotic (dead) spots and brown areas near the leaf tips. Rosetting of the leaves and dieback of terminal shoots. 	Reduced growth followed by symptoms of iron chlorosis, stunting, reduced branching, thickening and abnormal darkening of rootlets.	
Molybdenum (Needed for nitrogen fixation and nitrogen use in the plant; stimulates plant growth and vigor much like nitrogen)	The foliage turns yellow-green and growth is somewhat restricted. The deficiency occurs most commonly on acidic substrates. Only a problem with brassicas like broccoli, cauliflower etc in acid soil. Heads can fail to form, leaves will become thin, elongated and rippled. 	Rarely observed. Sometimes leaves turn golden yellow.	Add lime to soil before planting or sowing seeds