

NUTRIENT DEFICIENCIES AND EXCESSES

Nutrient (Symbol)	What it looks like	
	Deficiency	Excess
Primary Nutrients		
Nitrogen (N)	<ul style="list-style-type: none"> • Reduced growth • Light-green to yellow foliage (chlorosis) • Reds and purples may intensify with some plants • Symptoms appear first on older growth 	<ul style="list-style-type: none"> • Succulent growth; leaves are dark green, thick, and brittle • Poor fruit set
Phosphorous (P)	<ul style="list-style-type: none"> • Reduced growth • Leaves dark-green; purple or red color in older leaves, especially on the underside of the leaf along the veins • Leaf shape may be distorted • Thin stems 	<ul style="list-style-type: none"> • Shows up as micronutrient deficiency of zinc or iron
Potassium (K)	<ul style="list-style-type: none"> • Reduced growth • Shortened internodes • Margins of older leaves become chlorotic and burned • Necrotic (dead) spots on older leaves 	<ul style="list-style-type: none"> • Causes nitrogen deficiency and may affect the uptake of other nutrients
Secondary Nutrients		
Calcium (Ca)	<ul style="list-style-type: none"> • Inhibition of bud growth • Young leaves are scalloped and abnormally green • Leaf tips may stick together • Cupping of maturing leaves • Blossom end rot of many fruits 	<ul style="list-style-type: none"> • Interferes with magnesium absorption • High calcium usually causes high pH
Magnesium (Mg)	<ul style="list-style-type: none"> • Leaf margins may curl downward or upward with a puckering effect 	<ul style="list-style-type: none"> • Interferes with calcium uptake • Small necrotic spots in older leaves • Smaller veins in older leaves may turn brown
Sulfur (S)	<ul style="list-style-type: none"> • Rarely deficient • General yellowing of the young leaves, then the entire plant • Veins lighter in color than adjoining interveinal area 	<ul style="list-style-type: none"> • Sulfur excess is usually in the form of air pollution
Micronutrients		
Boron (B)	<ul style="list-style-type: none"> • Young leaves become thick, leathery, and chlorotic • Internal breakdown of fruit or vegetable • Death of apical buds, giving rise to witches' broom • Failure to set seed 	<ul style="list-style-type: none"> • Tips and edges of leaves exhibit necrotic spots coalescing into a marginal scorch (similar to high-soluble salts) • Oldest leaves are affected first • Can occur in low pH soils • Looks like magnesium deficiency, green veins on a yellow leaf
Chlorine (Cl)	<ul style="list-style-type: none"> • Wilted leaves which become bronze, then chlorotic, then die 	<ul style="list-style-type: none"> • Salt injury • Leaf burn
Cobalt (Co)	<ul style="list-style-type: none"> • Little is known about its deficiency symptoms 	<ul style="list-style-type: none"> • Little is known about its toxicity symptoms
Copper (Cu)	<ul style="list-style-type: none"> • In some species, young leaves may show interveinal chlorosis while tips of older leaves remain green 	<ul style="list-style-type: none"> • Can occur at low pH • Shows up as iron deficiency
Iron (Fe)	<ul style="list-style-type: none"> • Interveinal chlorosis primarily on young tissue, which may become white 	<ul style="list-style-type: none"> • Rare except on flooded soils

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Micronutrients	Deficiency	Excess
Manganese (Mn)	<ul style="list-style-type: none">• Interveinal chlorosis with smallest leaves remaining green, producing a checkered effect• Grey or tan spots usually develop in chlorotic areas• Dead spots may drop out of the leaf• Poor bloom size and color	<ul style="list-style-type: none">• Reduction in growth, brown spotting on leaves• Shows up as iron deficiency
Molybdenum (Mo)	<ul style="list-style-type: none">• Interveinal chlorosis on older or midstem leaves• Marginal scorching and rolling or cupping of leaves• Nitrogen deficiency symptoms may develop	<ul style="list-style-type: none">• Intense yellow or purple color in leaves• Rarely observed
Nickel (Ni)	<ul style="list-style-type: none">• Little is known about its deficiency symptoms	<ul style="list-style-type: none">• Little is known about its toxicity symptoms
Zinc (Zn)	<ul style="list-style-type: none">• Young leaves are very small, sometimes missing leaf blades• Short internodes• Distorted or puckered leaf margins• Interveinal chlorosis	<ul style="list-style-type: none">• Severe stunting, reddening• Older leaves wilt• Entire leaf is affected by chlorosis; edges and main vein often retain more color• Can be caused by galvanized metal