

PLANT FOOD INFORMATION

This is a summary of the nutrients, their functions, sources, mobility in plants*, and typical symptoms of deficiency.

In order to grow, plants need:

1. Water, both soil and atmospheric.
2. Air, both soil and atmospheric.
3. Light of proper intensity and duration.
4. Suitable temperature, both day and night.
5. Nutrients: nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, boron, copper, zinc, molybdenum and chlorine.

Nutrient	Function in Plants	Sources (Not intended as a complete list.) (Those italicized are water-soluble.)	Mobility in Plants*	Typical Symptoms of Deficiency +
NITROGEN (N)	Stimulates vegetative development. Necessary in production of leaves and stems.	<i>Ammonium Sulfate Urea</i> <i>Potassium Nitrate</i> <i>Calcium Nitrate</i> <i>Ammonium Phosphate</i> Ureaform-IBDU Methylene Urea SCU-PCSCU-PCU Cottonseed Meal Blood Meal	High	Restricted growth. Leaves small, pale, yellowish green early, sometimes orange to red later. Growth upright and spindly. Flowering and fruiting delayed and reduced. Premature defoliation. Symptoms appear first on lower parts, moving upward.
PHOSPHORUS (P)	Especially important in germination of seeds, metabolism of seedlings, ripening of seeds and fruits and general development of roots.	<i>Super Phosphate</i> <i>Ammonium Phosphate</i> <i>Potassium Phosphate</i> Bone Meal	Low	Greatly reduced and delayed growth. Leaves small and defoliation is premature, starting at older leaves. Lateral shoots reduced, lateral buds die or remain dormant. Leaf color generally dull, bluish green, tinting to purplish or bronzing later. Leaf margins often show brown scorching effect.
POTASSIUM (K)	Promotes general vigor. Contributes to disease resistance. Important to sturdy root formation and development.	<i>Potassium Phosphate</i> <i>Potassium Nitrate</i> <i>Potassium Chloride</i> <i>Potassium Sulfate</i> <i>Potassium Sulfate</i> <i>Magnesia</i>	Medium	Stunted, squatty growth, internodes shortened. Starting with older leaves – browning of tips, marginal scorching, development of spots near the margins, often “bronzed” appearance. Leaves may roll backward or forward along margins.
CALCIUM (Ca)	Constituent of cell walls of tissue. Intimately concerned in development of root system and growing points (meristems).	<i>Calcium Nitrate</i> <i>Calcium Chloride</i> Calcium Carbonate Calcium Sulfate Calcium Phosphate Dolomite	Low	Leaves distorted with tips hooked back and margins curled. Margins may exhibit brown scorching or spotting and often extreme collapse of mesophyll tissue. Growing points die, roots poorly developed and weak (sometimes gelatinous).
MAGNESIUM (Mg)	Vital to chlorophyll production. Activator in most enzyme reactions.	<i>Magnesium Sulfate</i> (<i>Epsom Salts</i>) <i>Potassium Sulfate</i> <i>Magnesia</i> Dolomite	High	Symptoms vary widely for different crops, but common symptoms include chlorosis, often developing into brilliant tints. Defoliation can be severe and leaves may abscise without withering. Effects show first on older leaves and progress to younger.
* Low mobility usually means visual symptoms appear first in new upper growth. High mobility usually means old (lower) growth shows visual symptoms first.		+ A proper balance of plant nutrients is very important. Excesses of mineral nutrients may induce deficiencies of others, e.g., excess nitrogen may produce potassium deficiency; excess potassium may induce magnesium deficiency; excess phosphorus, potassium deficiency; excess magnesium, potassium or sodium may induce calcium deficiency; excess boron marginal and intervenal scorch which may be confused with potassium or magnesium deficiencies; sodium and chlorine may cause marginal leaf scorch similar to potassium deficiency; excesses of chromium, cobalt, copper, manganese, nickel or zinc may induce iron deficiency in addition to producing direct visible toxic effects; excess manganese may produce effects similar to manganese deficiency (distinguished by soil pH test); and excess aluminum may cause effects suggesting phosphorus deficiency.		

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SULFUR (S)	Constituent of proteins. Necessary for chlorophyll formation.	<i>Ammonium Sulfate</i> <i>Various Sulfate Compounds</i> Soil Sulfur	Low	Restricted shoot growth, leaves small, rolled toward upper surface, stiff and brittle with marked chlorosis. Defoliation becomes severe and terminal buds die.
IRON (Fe)	Necessary for chlorophyll formation, but not a constituent of it. Concerned with respiration and other oxidation systems.	<i>Iron Sulfate</i> <i>Iron Sucrate</i> <i>Various Trace Element Combinations</i> <i>Sequestrene Iron</i>	Low	Chlorosis of leaves, affecting younger foliage first. Interveneal tissue yellows first, leaving veins green. Scorching of leaf margins and tips. Can be "lime-induced."
MANGANESE (Mn)	Catalyst in many enzyme systems. Concerned with chlorophyll formation. Closely associated with iron and the two elements can be antagonistic.	<i>Manganese Sulfate</i> <i>Various Trace Element Combinations</i>	High	Symptoms vary in different crops, but chlorosis is common. Older foliage affected first. Growth retarded with flower formation greatly reduced.
BORON (B)	Necessary for translocation of sugars. Involved in reproduction. Regulates water intake by cells. Tends to keep calcium in a soluble form in the plant.	<i>Sodium Borate</i> <i>Various Trace Element Combinations</i>	Low	Growing points severely distorted and may die. Stems hollow and pith coarse or blackened. Leaves often scorched and curled, possibly mottled and discolored. Fruits may be severely deformed and useless.
ZINC (Zn)	Necessary to protein synthesis. Influences rate of maturity and size of plant.	<i>Zinc Sulfate</i> <i>Various Trace Element Combinations</i>	Medium	Interveneal chlorosis, often with necrosis and bronzing or purpling. Reduced leaf size and malformation, sparsity of foliage, shortened internodes and reduced fruiting. Older leaves affected first.
COPPER (Cu)	Necessary to protein synthesis. Important to plants' reproductive stage of growth.	<i>Copper Sulfate</i>	Low	Leaves bluish-green color. Withering and marginal chlorosis of younger leaf tips. Leaves may fail to open out or may wilt. Growing tips may show rosetting.
MOLYBDENUM (Mo)	Essential constituent of nitrate reductase system. Necessary to nodule organisms of legumes.	Various Molybdenum Compounds	Low	Chlorotic mottling of leaves. Necrosis of leaf tissues. Distortion and death of growing tip in some crops. Irregular poor growth, stunted appearance.
CHLORINE (Cl)	Uncertain. May affect carbohydrate metabolism and influence photosynthesis.	<i>Potassium Chloride</i> <i>Calcium Chloride</i>		
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