NUTRIENTS IN SOIL

Element	Symbol	Function	Optimal Soil pH	Sources
Carbon	C			Air
Hydrogen	H			Water
Oxygen	O			Air, water
Primary Nutrients				
Nitrogen	N	• Responsible for rapid foliage growth and green color • Mobile in plant, moving to new growth • Easily leaches from soil	6.0 – 8.0	Air, compost, animal manures, fish, kelp, soybean meal
Phosphorus	P	• Promotes root formation • Affects quality of flower and fruit formation • Mobile in plant, moving to new growth • Does not leach from soil readily	6.5 – 7.5 and 9.0 – 10+	Bone meal, bat guano, superphosphate
	K	• Improves overall vigor of plant • Mobile in plant • Leaches from soil	6.0 – 10+	Compost, kelp meal, wood ashes, greensand
Secondary Nutrients				
Calcium	Ca	• Essential for growth of shoot and root tips • Improves soil structure and helps bind organic and inorganic particles together	6.5 – 8.5	Calcitic lime, dolomitic lime, gypsum
Magnesium	Mg	• Necessary for the production of chlorophyll • Aids movement and efficiency of phosphorus	6.5 – 8.5	Organic matter, Epsom salts, dolomitic limestone
Sulfur	S	• Component of many proteins	6.0 – 10+	Animal manure, elemental sulfur, gypsum
Micronutrients				
Boron	B	• Helps in use and regulation of nutrients	5.0 – 7.0	Organic matter, borax
Chlorine	Cl	• Required in photosynthetic reactions	Not available	Soil
Copper	Cu	• Needed for enzyme activity • Aids in root metabolism • Helps in utilization of proteins	5.0 – 7.0	Soil
Iron	Fe	• Essential for maintenance of chlorophyll	4.0 – 7.0	Soil, iron sulfate, iron chelate
Manganese	Mn	• Needed for enzyme activity	5.0 – 7.0	Soil
Molybdenum	Mo	• Needed for enzyme activity	6.5 – 10+	Soil
Nickel	Ni	• Essential for seed development	Not available	Soil
Zinc	Zn	• Needed for enzyme activity	5.0 — 7.0	Soil, zinc oxide, zinc sulfate, zinc chelate