

Plant Nutrient Requirements by Element

Soil Minerals	Role in Plant	Deficiency Symptoms	Causes
Boron (B) Micronutrient Deficient* 0.0 – 0.3 Adequate** 1.2 High 2.0 Hot water extraction (ppm)	Essential for normal plant growth (1923);** canola and legume crops in particular. Promotes crop maturity, water balance, flower set and yield.	<ul style="list-style-type: none"> • Leaf distortion and leaf texture changes • Death of growing points • Cracking and rotting • Poor fertilization and seed set 	<ul style="list-style-type: none"> • Low soil B • High soil pH • Excessive rainfall • Dry weather • Sandy soils with low organic matter
Calcium (Ca) Macronutrient Ca, Mg, K and H cation ratio's important	Cell wall structure component. No specific recommendation other than liming low pH soils, 5.5 or less. Acts as a catalyst for nitrogen uptake. An important part of soil C.E.C. ideal base saturation level is 65-75%	<ul style="list-style-type: none"> • Low storage potential of seed • Blossom end rot of tomatoes • Cavity spot in carrots • Hollow heart in potatoes 	<ul style="list-style-type: none"> • High nitrogen • Hot, dry weather • High potassium • High magnesium • High phosphate
Chlorine (Cl) Micronutrient Deficient < -8.0 Adequate unknown	Trace levels seem beneficial in root rot control in wheat and barley. Potash fertilizer is KCl.		
Chromium (Cr) Micronutrient Deficient unknown Adequate unknown	Unknown		
Copper (Cu) Micronutrient Deficient < -0.6 Adequate 0.9 – 2 High 2.5 + DTPA extraction (ppm)	Wheat, barley and flax crops are very sensitive to deficient Cu levels. Very important in plants reproductive growth stage and indirect role in chlorophyll production. Deficiency results in major yield and quality losses.	<ul style="list-style-type: none"> • Spiralling of leaves, especially the flag leaf, of cereals • Chlorosis of leaf tips • Stunted plants • Poorly filled heads 	<ul style="list-style-type: none"> • Low soil Cu • High soil pH • High soil organic matter (peat or muck) • High Fe • High manure applications
Fluorine (F) Micronutrient Deficient unknown Adequate unknown	No known role in plants.		
Iodine (I) Micronutrient Deficient unknown Adequate unknown	Some plant species reputed to accumulate this element.		
Iron (Fe) Micronutrient Deficient 5.0 Adequate 11 – 16 High 25 + DTPA extraction (ppm)	Critical for chlorophyll formation and photosynthesis. Important in enzyme systems and respiration in plants.	<ul style="list-style-type: none"> • Yellowing (chlorosis) of youngest leaves 	<ul style="list-style-type: none"> • High pH soils • High copper levels • Poor drainage • Calcareous soils • High Zn, Mn, or Cu levels
Magnesium (Mg) Macronutrient	The key element in the chlorophyll molecule. There would be no greening in the absence of Mg. First shows up as yellowing on older leaves. Important component of C.E.C. base saturation levels ideally are in 10-20% range.	<ul style="list-style-type: none"> • Intervenial chlorosis • Symptoms appear first on older leaves • Reduced crop growth 	<ul style="list-style-type: none"> • Low soil Mg • Low soil pH • High soil K • Poor drainage or compaction

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Manganese (Mn) Micronutrient Deficient < -4.0 Adequate 9 – 12 High 30 +	Important for all cereals on high pH mineral (alkaline) and organic soils. Enzyme systems involved with carbohydrate and nitrogen metabolism.	<ul style="list-style-type: none"> • Interveinal chlorosis (marbling) of younger leaves • Pale striping and brown spots on cereals • Floppy plants (cereals) • Upright growth habit and triangular leaves on Sugar Beet 	<ul style="list-style-type: none"> • Low soil Mn • High soil pH • High soil organic matter • Poor drainage • High Fe
Molybdenum (Mo) Micronutrient Deficient < -0.05 Adequate 0.11 – 0.2 High 0.40 + Hot water extraction (ppm)	Essential for nitrogen fixation in legumes and nitrogen metabolism in crucifers (canola). Mo deficiency resembles iron chlorosis. Forages range from 0.1 to 3 ppm/kg of dry matter.	<ul style="list-style-type: none"> • Reduced plant growth (symptoms of N deficiency) • Reduced leaf area (whiptail in cauliflowers) 	<ul style="list-style-type: none"> • Low organic matter • Low soil pH (acidic soils)
Nickel (Ni) Micronutrient Deficient unknown Adequate unknown	Role in plants unknown. Present in nuts, beans and peas.		
Nitrogen (N)	Important for synthesis of amino acids and production of chlorophyll. Essential for protein and nucleic acid formulation.	<ul style="list-style-type: none"> • Lack of growth or stunted growth • General yellowing of foliage, older leaves first • Loss of leaves under severe deficiency • Purplish colouration due to accumulation of anthocyanin pigments 	<ul style="list-style-type: none"> • Poor drainage (denitrification) • Leaching (low CEC and/or excess moisture) • Dry weather • Poor nodulation caused by low fertility, low pH, poor drainage or dry weather
Phosphorus (P) Macronutrient	Essential for all plant growth, i.e. energy transfer.	<ul style="list-style-type: none"> • Reduced growth • Production of dark green foliage • Reduced tillering in cereals • Reddening or yellowing of leaf margins and necrosis of older leaves • Reduced fruit quality and storage potential 	<ul style="list-style-type: none"> • Low soil pH • Cool soil temperature • High soil pH • Poor root system caused by wet soil, chemical or mechanical injury
Potassium (K) Macronutrient	The major ion inside every living plant and animal cell. Component of C.E.C. base saturation level is ideally 5-10%	<ul style="list-style-type: none"> • Mottled chlorosis, necrosis (especially at tips and margins between veins). • Older leaves most affected • In cereals, weak stalks, roots more susceptible to disease 	<ul style="list-style-type: none"> • Low soil K • Leaching of K (low CEC) • Dry weather • Poor drainage or compaction
Selenium (Se) Micronutrient	No known function but this mineral can accumulate in some plant species. Sulphur may interfere with selenium uptake in crop production.		
Silicon (Si) Micronutrient Deficient unknown Adequate unknown	The most abundant element on earth. Plays a role in disease resistance in crop plants. A structural component of some plant species.		

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Sodium (Na) Micronutrient Deficient unknown Adequate unknown	Many cultivated crops, such as beets, were originally sea shore plants. Sugar beets will respond to sodium fertilization.		<ul style="list-style-type: none"> • High water table • Manure applications • Runoff water • Low soil calcium levels
Sulphur (S) Macronutrient	Absolutely essential for plant growth. Deficiency causes yield loss in all crops, especially canola.	<ul style="list-style-type: none"> • Purplish colourations • Cupping of leaves • Slow stunted growth 	<ul style="list-style-type: none"> • Low soil S • Leaching of S on low CEC soils • Low soil organic matter
Tin (Sn) Micronutrient Deficient unknown Adequate unknown	Role not defined.		
Vanadium (V) Micronutrient Deficient unknown Adequate unknown	Present in plants such as dill, parsley and corn – role unknown.		
Zinc (Zn) Micronutrient Deficient < -0.5 Adequate 1.0 – 3.0 High 6.0 + DTPA extraction (ppm)	Very important in potato, flax, cereals and bean production. Deficiencies usually occur on eroded soils low in organic matter with high pH. Essential for sugar regulation and enzymes that control plant growth.	<ul style="list-style-type: none"> • Stunted plants • Pale stripes parallel to the leaf mid rib (maize) • Formation of rosettes (fruit trees) • Formation of small leaves • Chlorosis of young leaves 	<ul style="list-style-type: none"> • Low soil Zn • High soil pH • High soil P • High soil Fe