

Element	P	K	Fe	Ca	Mg
Optimum ppm	30-40	90-240	24-36	600-4500	60-500
Excess ppm	>100	>300	>100	>5000	>600
Excess levels	Tie up Fe, Mn, Cu and Zn. Caused around pH 7	Suppress uptake of Ca, Mg, Mn and ammonium. Occur high soil Ph.	Suppress uptake Mn, Zn, Cu and P Low soil pH Poor drainage	Suppress uptake K, Mg, Mn and B. Occur high soil Ph Cause Fe, Zn, Mn deficiency	Suppress uptake K, Ca High soil pH Cause Mn, Fe and Zn deficiency
Deficient ppm	<30	<50	<20	<500	<50-150
Deficient levels caused by	Low soil pH High soil Ph Cold and dry soils Compaction Thatchy turf	Low soil pH Compaction Dry soils Thatchy turf	High phosphorus High soil pH High levels Mn and Zn Excess N or P	Low soil pH Low CEC Alkali soils	Low soil Ph Low CEC Leaches in low pH
Preferred ratios		Mg:K 7:1 to 15:1	Fe:Mn 1:1 to 2:1 Fe:Zn 4:1 to 9:1 Fe:Cu 10:1 to 20:1	Ca:Mg 5:1 to 4:1	Ca:Mg 6:1 to 4:1 Mg:K 7:1 to 10:1

Element	Mn	S	Zn	B	Cu	Na
Optimum ppm	18-24	7-12	4-6	2.1-2.7	2-5	0-5
Excess ppm	>48	>50	>12	>10	>10	>500
Excess levels	Suppress uptake Fe Low soil pH		Suppress uptake Mn, Fe Low soil pH		Suppress uptake Mn, Fe Low soil pH	
Deficient ppm	<15	<5	<4	<2	<4	
Deficient levels caused by	Occurs low soil pH Excess P Poor drainage	Low soil pH High pH Excess N Low OM Very rare	High soil pH Excess P	Can be suppressed by lime	High soil pH Excess N	
Preferred ratios	Fe:Mn 1:1 to 2:1 Mn:Cu 8:1 to 13:1 Mn:Zn 3:1 to 6:1 Mn:B 8:1 to 13:1		Fe:Zn 4:1 to 9:1 Mn:Zn 3:1 to 6:1 Zn:Cu 2:1 to 4:1 Zn:B 2:1 to 4:1	Fe:B 10:1 to 20:1 Mn/Cu:B 8:1 to 13:1 Zn/Cu:B 2:1 to 4:1	Zn:Cu 2:1 to 4:1 Mn:Cu 8:1 to 13:1 Fe:Cu 10:1 to 20:1	

Optimum CEC Range in ppm

CEC	5	10	15	20
Element				
P	30-37	30-37	30-37	30-37
K	90-120	120-160	150-200	180-240
Mg	60-119	120-239	180-360	240-4800
Ca	600-1199	1200-2400	1800-3600	2400-4800

SOLUBLE SALTS	
Nutrient deficiency	<0.2
Possible problem	<0.8
Seeding	>1.7
Established turf	>2.6