

by Roger Funk, Richard Rathgens, The Davey Company

Essential Elements

Element	Percent of Plant Tissue**	Element	Percent of Plant Tissue**
Oxygen	45	Sulfur	0.1
Carbon	45	Iron	0.01
Hydrogen	6	Chlorine	0.01
Nitrogen	1.5	Manganese	0.005
Potassium	1.0	Zinc	0.002
Calcium	0.5	Boron	0.002
Phosphorus	0.2	Copper	0.0006
Magnesium	0.2	Molybdenum	0.00001

* Adapted from: B.R. Stout, 1961. Proceedings of 9th Annual California Fertilizer Conference, pp 21-23.

** These percentages vary from different species and for the same species grown under different conditions.

Forms Available to Green Plants

Elements	Available forms	Elements	Available forms
1. Macronutrients		2. Micronutrients	
Nitrogen	(N) NO_3^- , NH_4^+ , Urea (some)	Iron	(Fe) Fe^{++} , Fe^{+++}
Phosphorus	(P) HPO_4^{--} , H_2PO_4^-	Manganese	(Mn) Mn^{++} , Mn^{+++}
Potassium	(K) K^+	Copper	(Cu) Cu^+ , Cu^{++}
Calcium	(Ca) Ca^{++}	Zinc	(Zn) Zn^{++}
Magnesium	(Mg) Mg^{++}	Boron	(B) BO_3^{--}
Sulfur	(S) SO_4^{--} , SO_3^-	Molybdenum	(Mo) MoO_4^{--}
		Chlorine	(Cl) Cl^-

Salt Indexes

Fertilizer	Formula	%N	%P ₂ O ₅	%K ₂ O	Salt Index	Partial** Salt Index
Nitrogen sources						
Ammonium nitrate	NH ₄ NO ₃	35.0	—	—	104.7	2.99
Ammonium sulfate	(NH ₄) ₂ SO ₄	21.2	—	—	69.0	3.25
Sodium nitrate	NaNO ₃	16.5	—	—	100.0	6.06
Potassium nitrate	KNO ₃	13.8	—	—	73.6	5.34
Urea	H ₂ NCONH ₂	46.6	—	—	75.4	1.62
Natural organic		5.0	—	—	3.5	0.70
Monoammonium phosphate	NH ₄ H ₂ PO ₄	12.2	—	—	29.9	2.45
Diammonium phosphate	(NH ₄) ₂ HPO ₄	21.2	—	—	34.2	1.61
Phosphorus Sources						
Superphosphate	Ca(H ₂ PO ₄) ₂ + CaSO ₄	—	20.0	—	7.8	0.39
Triple superphosphate	Ca(H ₂ PO ₄) ₂	—	48.0	—	10.0	0.21
Monoammonium phosphate	NH ₄ H ₂ PO ₄	—	61.7	—	29.9	0.49
Diammonium phosphate	(NH ₄) ₂ HPO ₄	—	53.8	—	34.2	0.64
Monopotassium phosphate	KH ₂ PO ₄	—	52.2	—	8.4	0.16
Potassium Sources						
Potassium chloride	KCl	—	—	60.0	116.3	1.94
Potassium nitrate	KNO ₃	—	—	46.6	73.6	1.58
Potassium sulfate	K ₂ SO ₄	—	—	54.0	46.1	0.85
Monopotassium phosphate	KH ₂ PO ₄	—	—	34.6	8.4	0.24
* Adapted from: Rader, Jr., L.F., L.M. White and C.W. Whittaker, 1943. The Salt Index—A Measure of the Effect of Fertilizers on the Concentration of the Soil Solution. Soil Science Volume 55, pp 201-218.						
** Calculated per unit of N, P ₂ O ₅ , or K ₂ O.						