

# FERTILIZER

## TURF FERTILIZATION

by William Daniel, Purdue University

### Formulations of Turf Fertilizers

Nitrogen	No Phosphorous	High N, Low P Medium K	Similar P and K	Other
6-4-0	16-0-30	12-4- 8	12-12-12	8- 4- 4
21-0-0-24S	20-0-10	19-5- 9	14- 3- 3	8-22-16
30-0-0	20-0-16	20-3- 8	16- 8- 8	9- 6-18
31-0-0	28-0- 9	24-2- 9	20- 8- 8	10-15-30
32-0-0-30S	28-0-12	24-4-12	20-20-20	13-25-12
33-0-0	30-0-10	28-7-14	24- 3- 3	16-21- 3
38-0-0	33-0- 5	32-3-10		19-26- 3
41-0-0	33-0-10	34-3- 7		
45-0-0		34-5-10		
55-0-0				
66-0-0				

\* More than 100 formulations available in Indiana-1986

### Nitrogen Requirements

Species	Growing Months	Nitrogen per seasons lbs/1000 sq. ft.	Variation in Management
<b>Cool season:</b>			
sheeps & hard fescue	4-8	0-3	low maintenance, roughs
red fescues	4-8	1-3	low maintenance to good care
bentgrasses	4-8	1-4	medium care, lawn, fairways
bentgrass, greens	5-12	2-10	clippings removed, forced growth
Kentucky bluegrasses	5-12	2-4	clippings remain, coastal area
<b>Warm season:</b>			
bermudagrass, greens	8-12	8-20	may rest over winter
bermudagrass, overseeded	10-12	12-20	nurtured all season
bermudagrass, fairways & tees	5-12	4-9	good management
common bermuda	7-12	2-8	most variable
zoysia	6-10	1-6	adequate cover
St. Augustine, bahia	10-12	2-8	warm area, lawns

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) $\text{NO}_3^-$ , $\text{NH}_4^+$ , Urea (some)	Iron	(Fe) $\text{Fe}^{++}$ , $\text{Fe}^{+++}$
Phosphorus	(P) $\text{HPO}_4^{--}$ , $\text{H}_2\text{PO}_4^-$	Manganese	(Mn) $\text{Mn}^{++}$ , $\text{Mn}^{+++}$
Potassium	(K) $\text{K}^+$	Copper	(Cu) $\text{Cu}^+$ , $\text{Cu}^{++}$
Calcium	(Ca) $\text{Ca}^{++}$	Zinc	(Zn) $\text{Zn}^{++}$
Magnesium	(Mg) $\text{Mg}^{++}$	Boron	(B) $\text{BO}_3^{--}$
Sulfur	(S) $\text{SO}_4^{--}$ , $\text{SO}_3^-$	Molybdenum	(Mo) $\text{MoO}_4^{--}$
		Chlorine	(Cl) $\text{Cl}^-$

## Salt Indexes

Fertilizer	Formula	%N	%P <sub>2</sub> O <sub>5</sub>	%K <sub>2</sub> O	Salt Index	Partial** Salt Index
<b>Nitrogen sources</b>						
Ammonium nitrate	NH <sub>4</sub> NO <sub>3</sub>	35.0	—	—	104.7	2.99
Ammonium sulfate	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	21.2	—	—	69.0	3.25
Sodium nitrate	NaNO <sub>3</sub>	16.5	—	—	100.0	6.06
Potassium nitrate	KNO <sub>3</sub>	13.8	—	—	73.6	5.34
Urea	H <sub>2</sub> NCONH <sub>2</sub>	46.6	—	—	75.4	1.62
Natural organic		5.0	—	—	3.5	0.70
Monoammonium phosphate	NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub>	12.2	—	—	29.9	2.45
Diammonium phosphate	(NH <sub>4</sub> ) <sub>2</sub> HPO <sub>4</sub>	21.2	—	—	34.2	1.61
<b>Phosphorus Sources</b>						
Superphosphate	Ca(H <sub>2</sub> PO <sub>4</sub> ) <sub>2</sub> + CaSO <sub>4</sub>	—	20.0	—	7.8	0.39
Triple superphosphate	Ca(H <sub>2</sub> PO <sub>4</sub> ) <sub>2</sub>	—	48.0	—	10.0	0.21
Monoammonium phosphate	NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub>	—	61.7	—	29.9	0.49
Diammonium phosphate	(NH <sub>4</sub> ) <sub>2</sub> HPO <sub>4</sub>	—	53.8	—	34.2	0.64
Monopotassium phosphate	KH <sub>2</sub> PO <sub>4</sub>	—	52.2	—	8.4	0.16
<b>Potassium Sources</b>						
Potassium chloride	KCl	—	—	60.0	116.3	1.94
Potassium nitrate	KNO <sub>3</sub>	—	—	46.6	73.6	1.58
Potassium sulfate	K <sub>2</sub> SO <sub>4</sub>	—	—	54.0	46.1	0.85
Monopotassium phosphate	KH <sub>2</sub> PO <sub>4</sub>	—	—	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 <sub>2</sub> O <sub>5</sub> , or K <sub>2</sub> O.						