



FERTILIZER SALT INDEX

FACT SHEET

Virtually all fertilizer materials are salts. When they dissolve in the soil they increase the salt concentration of the soil solution. An increase in salt concentration increases the osmotic potential of the soil solution. The higher the osmotic potential of a solution, the more difficult it is for seeds or plants to extract soil water they need for normal growth.

Renewed interest in placing fertilizer in or close to the seed row makes it important to remember that an increase in salt concentration in the fertilizer band can cause seed and seedling injury. Placing fertilizer at least two inches away from the seed can usually prevent injury. Excess fertilizer application in a starter band can still produce injury, especially under dry conditions.

Salt index values for several fertilizer materials are listed in Table 1. A salt index is calculated by comparing the increase in osmotic potential brought about by addition of that fertilizer material compared to the increase in osmotic potential when an equivalent weight of sodium nitrate is added to water. The salt index of a mixed fertilizer containing N, P and K is the sum of the salt index values (partial salt index) of its components.

The salt index of sodium nitrate is defined as 100. Fertilizer materials with salt indices greater than 100 produce an osmotic potential greater than an equal weight of sodium nitrate. Fertilizers with salt index values less than 100 produce an osmotic potential less than an equal weight of sodium nitrate.

The salt index does not predict the amount of material that will produce injury to crops in a particular soil. It classifies fertilizer material relative to each other and shows which is most likely to cause injury. It is possible to formulate similar grades of mixed fertilizers from different materials that have significantly different salt indices.

Crop tolerances vary widely to increased osmotic potential from fertilizer near the seed. Wheat is moderately tolerant of high-salt conditions while soybeans are very sensitive. Corn is intermediate in tolerance. Dry soil conditions as well as fertilizers that produce free ammonia (urea, UAN, DAP) will significantly increase seed and seedling stress leading to injury or possible death. Be aware of the salt index of your starter fertilizer and don't over-stress your young crop.

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Fact Sheet No. 141
11/2013

Sources:

Salt Index of Fertilizers, 1986, Pm-1274d, Iowa State University
Fertilizer Application and Technology, 1999, Meister Publishing
Western Fertilizer Handbook, 1985, The Interstate Publishers & Printers

Table 1. Salt Index of Fertilizer Materials and Soil Amendments

Material and Analysis	Salt Index	Partial Salt Index *
Nitrogen:		
Anhydrous ammonia, 82% N	47.1	0.572
Ammonium nitrate, 34% N	104.0	3.059
Ammonium sulfate, 21% N, 24% S	88.3	3.252
Urea, 46% N	74.4	1.618
Urea-ammonium nitrate solution:		
28% N (39% ammonium nitrate, 31% urea)	63.0	2.250
32% N (44% ammonium nitrate, 35% urea)	71.1	2.221
Calcium nitrate, 15.5% N	65.0	4.194
Sodium nitrate, 16.5% N	100.0	6.080
Phosphorus:		
Ordinary superphosphate, 20% P ₂ O ₅	7.8	0.390
Triple superphosphate, 45% P ₂ O ₅	10.1	0.224
Monoammonium phosphate:		
11% N, 52% P ₂ O ₅	26.7	0.405
10% N, 50% P ₂ O ₅	24.3	0.405
Diammonium phosphate, 18% N, 46% P ₂ O ₅	29.2	0.456
Ammonium polyphosphate, 10% N, 34% P ₂ O ₅	20.0	0.455
Phosphoric acid, 54% P ₂ O ₅		1.613 **
Phosphoric acid, 72% P ₂ O ₅		1.754 **
Potassium:		
Potassium chloride, 60% K ₂ O	116.2	1.936
Potassium hydroxide, 83.6% K ₂ O		1.015
Potassium nitrate, 13% N, 44% K ₂ O	69.5	1.219
Potassium sulfate, 50% K ₂ O, 18% S	42.6	0.852
Sulfate of potash-magnesia, 22% K ₂ O, 11% Mg, 22% S	43.4	1.971
Monopotassium phosphate, 52.2% P ₂ O ₅ , 34.6% K ₂ O	8.4	0.097
Potassium thiosulfate, 25% K ₂ O, 17% S	68.0	2.720
Sulfur:		
Ammonium thiosulfate, 12% N, 26% S	90.4	7.533
Ammonium polysulfide, 20% N, 40% S	59.2	2.960
Gypsum, 23% Ca, 17% S	8.1	0.247
Magnesium oxide, 60% Mg	1.7	0.002
Magnesium sulfate, 10% Mg, 14% S	44.0	2.687
Miscellaneous:		
Calcium carbonate, lime, 35% Ca	4.7	0.083
Dolomite, 21.5% Ca, 11.5% Mg	0.8	0.042
Manure salts, 20%	112.7	4.636
Manure salts, 30%	91.9	3.067

* The salt index of a mixed fertilizer containing N, P and K is the sum of the partial salt index per unit (20 lbs) of plant nutrient times the number of units due to each component in the formulation.

** Per 100 lbs of H₃PO₄