

Fertilizer and Drought

by Turf Service Bureau
Milwaukee Sewerage Commission

Fertilizer applications on unirrigated turf often do more harm than good even though fertile soils do increase water efficiency as much as 50%, provided water is available in the soil to begin with. Where there is too much fertilizer salt in the soil for the amount of usable water, trouble occurs.

The most injurious fertilizer salts are certain soluble nitrogen and potash sources, including ammonium nitrate, ammonium sulfate, nitrate of soda, muriate of potash and sulfate of potash. Urea is an organic compound that converts rapidly to similar materials in the soil. Ordinary superphosphate, being slowly soluble has little salt effect.

Drought can be a problem for turf growers even with adequate rainfall and supplemental irrigation. This is referred to as **physiological** drought. It involves raising the salt concentration of the soil solution to a point higher than the concentration of fluids within the plant roots. Water movement always goes toward higher salt concentrations, so instead of going into the root, the flow is reversed. With fertilizer salts, this may not be permanent, but is certainly not as temporary as some have supposed. Even a few hours of wilt can severely damage golf turf.

The tendency of fertilizers to perform in this way is called their Salt Index. Rader, White and Whittaker reported this in Soil Science Proceedings 55: 201-18 (1943).

"When applied in excessive amounts or when the soil is very dry, certain salts burn or cause plants to wilt more than others. Burning is measured by the salt index and is due to the effect the salt has in increasing the osmotic pressure of the soil solution."

When growth conditions are right, the higher concentration of plant nutrients is inside the plant. Under these conditions, movement or intake of water, nutrients and oxygen is normal and the liquid moves into the plant roots. This phenomenon is called osmosis. When the concentration of salts in the soil is higher than in plant roots, osmosis is reversed and we see physiological drought manifest as wilt or fertilizer burn (on leaves).

The following table lists some fertilizers more commonly associated with the turf industry. The salt index is a comparison of the same amount of each material.

SALT INDEX

Material	Salt Index
60% Muriate of Potash	116
Ammonium Nitrate	109
Sodium Nitrate	100
Urea	75
Potassium Nitrate	74
Ammonium Sulfate	69
Calcium Nitrate	53
Sulfate of Potash	46
20% Superphosphate	8
Gypsum	8
Organic Ammoniates	3.5

The latter group includes cottonseed meal, leather tannage, manure, Milorganite, etc. Great differences are found within this group, based on content, processing and granulation. Wisconsin researchers de-

termined that the Index of Milorganite was only 0.0067, according to Noer.

Many comparisons can be drawn from the above Chart. Muriate of Potash has twice the burning tendency of Sulfate of potash. Ammonium Sulfate, though it has a lower salt index than Urea, must be applied at heavier a rate to supply an equal amount of nitrogen, thereby increasing the hazard of burn as used in practice.

The problems associated with inorganics does not mean their use should be eliminated. Where clippings are removed at each mowing or in the initial seedings, they almost always should be used, especially in regard to potash and sometimes phosphorus. This reason alone shows the importance of soil tests to professional turf growers.

However, you do have a choice of the form of materials used to supply the necessary nutrients. This is of prime importance during hot and dry weather or when applications are to be made on frozen soil. In summary, consider the following points:

1. Fertilizer salts complicate irrigation practices.
2. The higher the salt index, the greater the need for frequent and copious watering. This increases the cost of both water and fertilizer.
3. Where possible, the use of inorganic chemical fertilizers should be confined to cool weather on moist soils.
4. Manufacturers of most mixed fertilizers use materials with higher salt indexes because they are the cheapest.
5. A high analysis fertilizer doesn't mean you are using more of the nutrient. You save only handling bulk, but at the cost of more difficult distribution and important minor elements such as sulfur. And by the way, turfgrasses use as much sulfur as they do phosphorus.
6. A foliar burn is dehydration. Even when inorganic fertilizers are carefully handled to prevent this, they can impair water intake by the roots. This can be noted by the absence of dew in the morning or excessive mid-day wilt for several days after application.

Rural School Teacher: "If I lay one egg on the table and two on the chair, how many will I have?"

Little Willie: "Personally, I don't think you can do it."

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