TURF **TIPS**

Zinc in Turf Grass

Zinc is a plant essential nutrient. It is necessary for plant growth and is taken up by the plant in the form of a cation, Zn++. It is utilized in the following processes: activation of enzymes, chlorophyll formation, growth hormone regulation, cell growth and seed formation. Since zinc is immobile in the plant, visual deficiency symptoms (interveinal yellowing) will be most prominent in newly emerged tissue.

Factors Affecting Zinc Availability

Soil pH–The solubility and availability of zinc is directly related to soil pH. In alkaline soil, solubility is low and increases as the soil becomes more acidic. The table below predicts zinc concentration at various pH levels. For every one pH unit change, there is a tenfold change in the soil zinc concentration.

Soil pH	Soil Zn Solubility
4.0	4.12 ppm
5.0	0.412 ppm
6.0	0.0412 ppm
7.0	0.00412 ppm
8.0	0.000412 ppm

Organic Matter– Zinc deficiencies are frequently associated with soil low in organic matter. Soil organic matter behaves much like a chelate in holding zinc in the soil. The chelating nature of organic matter protects zinc from reacting with other soil minerals that contribute to zinc "tie-up," and causes zinc to accumulate in topsoil. Because of this, areas with a high degree of dirt work (cutting and filling) or heavy erosion are most prone to zinc deficiencies. This is further exaggerated when the newly exposed subsoil is alkaline.

Constructed sand-based soils are, by design, low in organic matter. Generally, the organic material used in an 80:20 mix is organic residue, not fully decomposed organic matter. Meaning, that without continued applications of organic residue, the reactivity remains very low and will be short lived (depending on geography, up to 3 years) in the soil.

Total Zinc Content–The original minerals present during soil formation determine the total zinc concentration in the soil. The total zinc content of the soil (available plus unavailable) can range from 10 to 300 ppm with an average of 50 ppm. The total zinc acts like a reservoir of potentially available zinc. The availability of the reservoir is dependent on the pH and organic matter. Most zinc minerals are contained in the silt and clay fraction of the soil. Therefore, medium and fine textured soils usually have higher levels of zinc and are less prone to zinc deficiency than sandy textured, or sand constructed soils.

Phosphorus –Research has shown that phosphorus fertilizer can induce zinc deficiencies, although, this only occurs when soil test levels are low to marginal (< 1.0 ppm Zn). With these low levels, high phosphorus applications will intensify a zinc deficiency. If zinc levels are greater than 1.0 ppm, phosphorus induced zinc deficiency will not occur.

Soil Temperature and Moisture–Cold, wet soil reduces root growth, zinc uptake, zinc solubility and the amount of zinc released from soil organic matter. As a result, the most severe zinc deficiencies occur in cold, wet and poorly drained soil.

Diagnosing Deficiencies

Soil Analysis–The extract most commonly used for zinc is DTPA, which is a chelate. The critical level for DTPA extractable zinc is approximately 1.0 to 5.0 ppm. A value less than 1.0 ppm would be considered deficient. The process of interpreting a zinc soil test can be improved when other factors that affect zinc availability, including the factors mentioned above, are taken into account. For example, a soil-test level of 1.0 ppm would be adequate in a slightly acidic, medium textured soil, with an organic matter level of 2 percent. However, a 1.0 ppm zinc level would definitely be deficient in an alkaline sandy soil with an organic matter level of less than 1 percent.

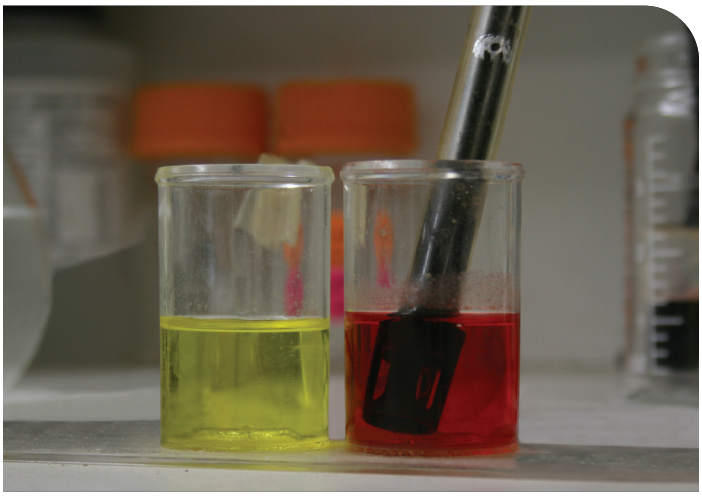
Application rates of zinc will be determined by the types and grades of fertilizer materials used.If needed, buy a fertilizer material containing zinc and follow the label for the correct rate. Zinc should be applied with the first application of the growing season, when soil temperatures are cool.

Plant Analysis — Since many factors can affect zinc availability, a plant tissue sample is an excellent diagnostic tool to complete a fertility monitoring program. This tool allows you to observe the actual zinc concentration in the plant, if the plant is getting enough zinc, or if too much zinc is present in the soil.Critical zinc levels for some turf grasses:

- **Bermudagrass: 50 – 80 ppm**
- **Bluegrass: 40 – 60 ppm**
- **Bentgrass: 80 – 120 ppm**

Toxicities

Zinc toxicities have not been documented in turf grasses. Research studies included application rates of up to 1,000 pounds/acre, with no negative effect. Very high levels of zinc (50-100 ppm) are common, however, they are particularly high in areas of intensive turf management such as golf greens and golf courses over 10 years old. Even though an agronomic toxicity may not occur, it is important to identify where the zinc is coming from (fertilizers, irrigation water, top dress materials, such as sand or organic compost, or fungicide applications) and eliminate the source. These high levels may or may not decline over the years, but it is important to keep zinc levels from getting higher.



Conclusion

Soil pH, organic matter, phosphorus, soil temperature and soil moisture all have an effect on zinc availability.Soil and tissue tests can identify zinc deficiencies and determine how much fertilizer is needed to correct the problem.