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Understanding and Minimizing Drought Stress

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Drought is a period of dryness. Drought stress is a result of an extended time without precipitation, combined with the lack of an irrigation capability and a high evapotranspiration (ET) rate. The severity of soil drought is affected by the duration without rain, the evaporative power of the air, and the water retention characteristics of the soil. The frequency with which a soil drought occurs is greater in the arid and semi-arid climatic regions. Droughts are most likely to occur during the midsummer period, although the actual timing of occurrence and frequency are not predictable.

Drought resistance is a general term encompassing a range of mechanisms whereby plants withstand periods of dry weather. There are three primary components of drought resistance in turfgrass: (a) dehydration avoidance, (b) dehydration tolerance, and (c) escape

Dehydration avoidance is the ability of the plant to avoid tissue damaging water deficits even while growing in a drought environment favoring the development of water stress. In this case a positive water balance is maintained within the plant by excluding the water stress usually via enhanced rooting and/or a reduced evapotranspiration rate. **In contrast, dehydration tolerance is the ability of a plant to endure low tissue water deficits caused by drought**. In this case the plant possesses mechanisms to prevent or minimize tissue damage even though a negative tissue water balance exists. Drought escape involves the completion of an entire life cycle, or critical portions thereof, during drought-free periods in an otherwise drought-dominated environment.

The turfgrass manager has a number of options available to prepare a turf for drought stress. Included are:

- Select drought resistant species and cultivars.
- Optimize turfgrass dehydration tolerance.
- Maximize rainfall effectiveness.
- Maximize water absorption by roots.

Select Drought Resisant Species and Cultivars

Turfgrass species vary greatly in their relative resistance to drought stress (*Table 1*). If one knows prior to establishment that the turf area will not be irrigated or that the capability to irrigate will be limited, it usually is advisable to select drought resistant turfgrass species and cultivars.

Most C4, warm-season turfgrasses have considerably better drought resistance than for the C3, cool-season species. Note that species with a low shoot evapotranspiration rate and deep, extensive root system will have good dehydration avoidance which is a key component of drought resistance as it shortens the duration of internal tissue water deficits. There are significant differences in drought resistance among turfgrasses not only in shoot recovery but also in leaf firing. There is an opposite relationship between leaf firing and shoot recovery for each species and cultivar. This means that those turfgrasses which turn yellow or brown earlier tend to have poorer post-drought stress shoot recovery, in other words, poor drought resistance.

Studies of inherent dehydration tolerance have revealed surprising differentials among warm-season turfgrass species. Texas Common St. Augustinegrass, which ranks only good in both dehydration avoidance and drought resistance, had quite

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