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Turfgrass Winter Stresses

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Winterkill is a general term that encompasses all stresses that may damage turfgrasses during the winter period. It is important to properly diagnose the specific cause of winter injury in order to implement the appropriate practices that will minimize a potential reoccurrence in future winters. Seven types of winter stress are summarized in the accompanying table. Low temperature kill and winter desiccation are the most common winter stress problems. The low temperature pathogens that cause snow mold diseases are additional major winterkill problems and will not be discussed in this particular article.

Low Temperature Kill. Both cool- and warm-season turfgrass species are subject to severe injury caused by low temperature kill. **The extent of injury relates to the size of ice crystal formation within the plant tissues,** which results in mechanical damage to the living portions of cells. **The higher the water content or hydration level in the tissue, the greater the potential for low temperature kill.** Thus, any soil management or cultural practice—such as a low cutting height, high nitrogen nutrition level, low potassium level and/or impaired drainage—that increases the crown hydration level during the autumn hardening period will result in increased proneness to low temperature kill. Contrary to recent widely published reports, it is essential to understand that **high crown hydration is not a cause of winterkill, but rather a precondition** that contributes to increased proneness to lethal injury.

Chilling injury of warm-season species occurs at temperatures of 54 to 60°F (12–16°C), and should not be confused with low temperature kill, which occurs at temperatures well below 32°F (0°C). Chilling stress results in autumn low temperature discoloration of the shoots of warm-season turfgrass species, but does not kill the meristematic tissues of the crowns and the nodes on lateral stems.

Cold Hardening. Turfgrasses have a natural ability to cold harden during the autumn decline in temperature that occurs prior to freezing, which is **at temperatures between 35 and 45°F (2–7°C) for cool-season turfgrasses.** Basically, cold hardening involves physiological adjustments within the plant that maximize the ability of the plant to survive low temperature stress. Two key physiological processes during this event involve the accumulation of carbohydrates, which in turn result in exosmosis, or the outward movement of water from the tissues. The more low temperature hardy species, such as creeping bentgrass and rough bluegrass, have the capability to decrease their tissue water content from 85% to the 65 to 70% range during cold hardening. Accordingly, one should **select cultural practices during this cold hardening period that promote increased carbohydrate accumulation.** These include an elevated cutting height and a moderate to low nitrogen fertilization program. Cold hardened turfgrasses typically have enlarged stem and crown diameters in the autumn due to the accumulation of carbohydrates.

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