

MINIMIZING DIRECT LOW TEMPERATURE KILL

Both cool- and warm-season turfgrasses can be seriously damaged by direct low temperature kill. The mechanism of injury involves ice crystal formation either within, termed intracellular freezing, or in the immediate exterior space of plant cells when temperatures fall below 32°F (0°C). Eventually these ice crystals can cause, either directly or indirectly, a mechanical rupturing of the vital living protoplasmic portion of plant cells. A higher plant tissue water content typically results in larger and more extensive ice crystal formation. Consequently, any cultural practices or modification of site conditions that result in a reduced plant water content, termed the hydration level, will reduce the potential for direct low temperature kill, although it is not an absolute means of prevention. Note that a turfgrass plant may have damage to the leaves and the roots and still survive, as long as the meristematic regions in the crown and/or nodes of lateral stems are not injured.

Drainage should be the number one priority in minimizing the potential for direct low temperature kill. This includes appropriate surface contours that ensure rapid, timely removal of excess surface water from vital turfgrass areas. Even shallow depressions that result in only a 0.25 to 0.5 inch (6.4 to 13 mm) depth of water on the soil surface can result in a substantial increase in direct low temperature kill.

Drainage enhancement also can be accomplished by subsurface means, such as a drain line system, catch basins, dry wells, and French drains.

Certain turfgrass cultural techniques also can be used to reduce the plant water content and especially the meristematic/crown hydration level.

They include the following:

- Avoid an excessive autumn **nitrogen (N)** fertilization level that stimulates shoot growth and consequently increases tissue hydration levels.
- Avoid inadequate **potassium (K)** levels. Generally the potassium fertilization level should be maintained at 75 to 100% of the nitrogen fertility level, assuming soil tests reveal adequate existing potassium levels.
- Raise the **cutting height**. This has the dual function of (a) providing an increased surface biomass of vegetation that gives an insulating effect in protecting the vital meristematic tissues under the canopy, and (b) provides increased leaf area for the synthesis of carbohydrates that contribute to the vital cold hardening process for the last 2 to 3 weeks prior to cessation of plant growth. Extraordinarily close mowing heights on hybrid bermudagrass (*Cynodon* spp.) putting greens has been a major contributor to the recent direct low temperature kill problems.
- Avoid **thatch** accumulations that elevate the vital meristematic areas of crowns and nodes higher above the protective soil zone.
- Finally, excluding traffic from turfs can be beneficial, especially during periods of active freezing and/or thawing.

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