Bermudagrass Winter Injury

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Traditionally, the most susceptible periods for bermudagrass injury has been in early winter, around Christmas, or in late winter, such as early- to mid-March. In the early winter scenario, the bermudagrass is still often green due to a mild fall, has not hardened off and then a severe cold front passes through plummeting temperatures from the 70sF one day to the lower 20sF or upper teens the next day. Research indicates that 50% bermudagrass stand loses occur between 18 and 23 F. In the March scenario, a typically mild February has the bermudagrass trying to green-up and then a late severe cold snap occurs. In these situations, sugars and carbohydrates have not been totally converted into the more cold-tolerant starches. But just as important, these cold fronts typically bring very dry air and windy conditions. In turn, turf crowns typically dry out, reducing the buffering action of the moisture, thus, they become cold susceptible. In another case, rain often precedes these fronts, causing standing water, and then the drastic drop in temperature occurs freezing the crowns, causing leakage or damage to turf from traffic. As turf managers, we obviously cannot control the weather. However, there are several management practices to help prevent or minimize winter kill and include:

1. **Excessive traffic**. As mentioned, traffic can crush frozen crowns, killing the plant. Traffic also reduces soil oxygen levels which weakens the plant, making it more susceptible to low temperature kill. Most often observed on tees, tee and green approaches, and in golf traffic areas in fairways.
2. **Standing water**. Poor surface and subsurface drainage results in direct temperature damage to crowns.
3. **Moisture deficiency**. Just as excessive moisture may increase low temperature kill, lack of moisture also contributes to injury. A certain amount of moisture is needed in the plant for crown tissue to survive. If moisture deficiency occurs, these tissues are weakened and are more susceptible to damage.
4. **Potassium deficiency**. Soil test levels should indicate medium to high levels while leaf tissue analysis should be at least 1.5% K.
5. **Excessive thatch**. Excessive thatch elevates crowns and lateral stems above the more insulating soil.
6. **Excessive fall nitrogen fertilization**. Late fall nitrogen fertilization promotes succulent green tissue growth and reduced root carbohydrate formation. A 4-1-2 or 3-1-2 ratio of the last fertilization in late summer has shown best results in minimizing low temperature damage.
7. **Excessive dessication**. Excessive wind, especially during periods of low humidity, often can cause massive areas of winter damage. If the turf is not covered by snow, managers may have to artificially cover them to minimize the dessication leading to low temperature kill.
8. **Close mowing**. Close mowing in late summer discourages deeper rooting and

carbohydrate reserve accumulation which can contribute to low temperature kill.

9. **Shade on bermudagrass**. Shade reduces the carbohydrate levels in bermudagrass, produces a weaker plant, and keeps soil temperatures lower due to lack of sunlight. Competition from tree roots for nutrients and water also weaken turfgrasses. Slopes facing the north or northeast receive less (or little) direct sunlight in the winter and are more prone to injury.
10. **Grass cultivar**. Generally, the common type bermudagrasses are more susceptible to low temperature damage. Cold tolerant cultivars tend to have deeper growing, more dense rhizomes which escape low temperature damage by being better insulated in the deeper soil profiles. Vamont, Midiron, TifSport and Quickstand bermudagrasses are cultivars which have increased cold tolerance, however, leaf texture and density of these are less desirable than Tifway. The zoysiagrass cultivars - Korean Common, Meyer, Belair, and El Toro - show promise for being more cold tolerant.
11. **Pest or pesticide damage**. Pests which damage roots, for example mole crickets and white grubs, and pesticide which may restrict rooting of immature plants (some preemergence herbicides) may add to low temperature damage. Root rotting (*Pythium* spp.) and patch-type diseases (*Rhizoctonia*, *Gaeumannomyces*, and *Leptosphaeria* spp.) also weaken grasses.

The most severe winter-kill this past year occurred on shaded bermudagrass greens. Many parts of the Carolinas had up to 14 days in December, 2000 with temperatures below 40 F. Shaded turf stayed frozen and when these areas were exposed to traffic, devastated effects often occurred. New bermudagrass greens, especially sodded greens or greens established in late summer, also experienced more damage than sun-exposed greens or greens sprigged and/or planted in early to mid-summer. This was especially acute on sand (or California style) greens. Pure sand greens have little buffering capacity against temperature extremes. Sand greens also hold moisture and nutrient very poorly. In many instances, sod roots do not adequately penetrate and grow in this media the first several years, presumably due to the lack of moisture and nutrients in these. Obviously, poorly rooted turfgrasses are more susceptible to temperature extremes. Many of the new 'ultradwarf' bermudagrasses also do not produce the number nor depth of rhizomes as taller, upright growing cultivars. Since deep rhizomes are lacking, an inherent increase to environmental extremes occurs. As these greens mature, this susceptibility to environmental extremes will probably cease.

Most parts of the Carolinas are in the Transition Zone where almost all turfgrasses will survive and grow. However, none perform flawlessly as each year hot, humid summers often weaken bentgrass greens and cold winters, especially in those areas in shade, weaken bermudagrass.

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