Understanding Low-Temperature Kill

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The kill of grass plants caused by ice crystal formation at temperatures below 32°F (0°C) is termed low-temperature kill. It may be of either an intercellular or extracellular nature, in which the brittle protoplasm organization is fatally damaged via a mechanical destruction. The absolute temperature at which a particular species and cultivar is killed may vary substantially depending on the (a) hardiness level the plant achieved, (b) rate of freezing, (c) rate of thawing, (d) number of times frozen, (e) length of time frozen, and (f) post-thawing treatment which is either favorable or unfavorable for growth.

Certain cultural practices can be utilized to minimize the extent of direct low-temperature kill, such as: (a) ensure drainage of excess water by adequate surface drainage through the proper contouring and use of open catch basins, plus as appropriate and affordable, the use of a well-drained high-sand root zone combined with subsurface drainlines to ensure rapid removal of excess water, (b) maintain a relatively low nitrogen nutritional level during the autumn hardening period such that it sustains only minimal growth, (c) maintain a balance of essential plant nutrients, plus a high potassium level, (d) raise the cutting height to maximize carbohydrate production and provide increased canopy insulation, (e) judicious irrigation during the autumn hardening period, which avoids waterlogging and excessive shoot growth, and (f) selection of low-temperature kill hardy turfgrass species and cultivar(s).

Low-temperature kill hardiness is the ability of the grass plant to survive potentially lethal low temperature stress at temperatures below 32°F (0°C). Plant hardiness is achieved primarily by the redistribution water, and includes lowering the hydration level of the critical meristematic tissues. This hardening process typically occurs at temperatures in the range of 35 to 40°F (2–5°C). Any cultural practice that stimulates leaf growth will adversely affect the hardiness process. The relative low-temperature kill hardiness of 31 autumn-hardened turfgrasses is shown in the accompanying table.

Relative Low-Temperature Kill Hardiness	Turfgrass
excellent	rough bluegrass
	creeping bentgrass
	turf timothy
good	Kentucky bluegrass
	Canada bluegrass
	velvet bentgrass
	crested wheatgrass
	colonial bentgrass
	redtop
moderate	creeping bluegrass
	fine-leaf fescues
	American buffalograss
	blue grama
	annual bluegrass
	perennial ryegrass
	tall fescue
	meadow fescue
	Japanese zoysiagrass
poor	dactylon bermudagrass
	manila zoysiagrass
	seashore paspalum
	hybrid bermudagrass
very-poor	centipedegrass
	mascarene zoysiagrass
	common carpetgrass
	annual ryegrass
	bahiagrass
	St. Augustinegrass
	kikuyugrass
	tropical carpetgrass
	serangoongrass