



TURFAX™

Volume 6, Number 6



November–December 1998

of the International Sports Turf Institute, Inc.

The International Newsletter about Current Developments in Turfgrass

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Winter Ice Cover Problems?

James B Beard

The injury mechanism and factors influencing low-temperature kill of turfs were discussed in the January–February 1998 Turfax™. During the past four decades numerous writers have included ice cover damage caused by oxygen suffocation under the ice layer as being a major cause of winterkill. A survey of the turfgrass research literature on this subject reveals no valid scientific data to support this ill-founded concept.

Misinterpreted Research. A commonly published guideline advises removal of an ice cover after 20 days in place. There is no validity to this guideline as related to the fibrous roots and small meristematic crowns of perennial grasses. The 1960s origin of this 20-day maximum is based on University of Wisconsin research with the very fleshy, high-carbohydrate, taprooted alfalfa species (*Medicago sativa*). Physiologically, the root-crown system of this legume is drastically different from that of a turfgrass, including the respiration rate.

Clarifying Research Conducted: Specific published studies^{2,3,4} and numerous “real-world” field observations demonstrate that C₃, cool-season, perennial turfgrasses can survive more than 75 days under dense ice cover with no injury. Typically, an ice cover would be in place for a shorter duration than 150 days. The most complete ice cover study was conducted at Michigan State University by J.B. Beard and J.W. Eaton. Three species were compared: creeping bentgrass (*Agrostis stolonifera*) at a 0.25-inch (6.4 mm) cutting height, Kentucky bluegrass (*Poa pratensis*) at a 1.5-inch (38 mm) cutting height, and annual bluegrass (*Poa annua* var. *annua*) at a 1.0-inch (25 mm) cutting height. Mature turfs of these three turfgrasses were allowed to fully harden well into December in East Lansing, Michigan, and then 4-inch (100 mm) turf plugs were collected. The turfs were placed in quart jars, which were then filled with water and slowly frozen. Then the top of the ice was capped off with a small amount of water, the cover plate was screwed tight with a rubber gasket and jar sleeve, and the ice encasement system was frozen. There were four replications involved, with the turfs encased in ice held at 25°F (−4°C) for 15-day durations of up to 5 months. A set of 4 replications were removed at 15-day intervals, thawed slowly, and evaluated for turf survival in a glasshouse.

The results—summarized in Table 1—revealed that **both creeping bentgrass and Kentucky bluegrass survived 5 months, or 150 days, of dense ice encasement without significant injury.** In contrast, **the annual bluegrass was killed between the 75th and 90th days.** These results revealed that ice coverage for up to 150 days may not be of concern where creeping bentgrass and Kentucky bluegrass turfs are involved. However, for annual bluegrass an ice cover persisting for more than 75 days is of concern. In the case of the annual bluegrass the cause of death was probably a toxic accumulation of respiratory gases under the relatively impermeable ice cover.

Why the Confusion? A common occurrence associated with ice covers is low-temperature kill in a pattern

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