Copin' with Cold, as in Ice Injury

BY KARL DANNEBERGER

Intermittent ice formation on golf course greens and fairways is a common event in the North. Ice cover is often considered part of winter injury caused directly by a continuous ice cover or as part of freeze injury (low temperature kill).

The first type of ice injury is the direct result of a continuous ice cover often referred to as freeze smothering.

In the early to mid 1960s, renowned turfgrass researcher Jim Beard conducted controlled laboratory studies where he looked at the survival rate of three cool-season turfgrasses — one under a continuous ice cover and two under field conditions. He found that creeping bentgrass could survive 120 days of continuous ice cover, while *Poa annua* loss occurred after 60 days with substantial loss around 75 days.

In a more recent Canadian field study, *Poa annua* and creeping bentgrass turf was subjected to 45 days of continuous ice cover and then the ice was removed. Seventy-five days after initiating the study and 30 days after removing the ice cover, the creeping bentgrass still maintained its cold hardiness, while the annual bluegrass was dead. It would appear from this study that annual bluegrass under a continuous ice cover needs to be removed prior to 45 days.

The reasons commonly proposed for ice injury are the buildup of toxic gases and/or the development of anoxic conditions and the loss of cold hardiness. It appears that carbon dioxide (CO_2) accumulation under ice cover is a major contributor to the death of herbaceous plants. Intermittent thawing helped eliminate the CO_2 buildup, and injury to the plants in this study didn't occur.

The loss of cold hardiness under ice cover occurs and varies among turfgrass species. Under continuous ice cover, *Poa annua* loses its cold hardiness, while creeping bentgrass is not affected. The loss of cold hardiness in *Poa annua* is likely because of the anoxia (lack of oxygen) conditions that develop under ice cover.

REASONS FOR ICE INJURY ARE BUILDUP OF TOXIC GASES AND/OR THE DEVELOPMENT OF ANOXIC CONDITIONS AND LOSS OF COLD HARDINESS

In areas where continuous ice cover for more than 45 days is unlikely because of intermittent periods of thawing, ice formation can play a role in freeze injury. Under this scenario, a rapid drop in temperature resulting in freezing water around the growing point during late winter or early spring can cause freeze injury primarily to *Poa annua*.

The critical precursor to freeze injury is the loss of cold hardiness through dehardening and subsequent rehydration of the *Poa annua* crown region. Continuous ice cover as previously mentioned contributes to the decline in cold hardiness.

However, the most important factor regulating dehardening is temperature. In *Poa annua*, the dehardening process can occur quickly when soil temperatures exceed 46 degrees Fahrenheit for 48 hours.

What cultural practices can be instituted to minimize ice injury and/or freeze injury? Some key points include:

- Produce a healthy plant going into the winter. A weak *Poa annua* plant with low carbohydrate storage is not going to tolerate ice cover or be resistant to freeze injury as a healthy plant. Shaded areas are more prone to freeze injury than sunny areas, probably due to the carbohydrate status of *Poa annua.*
- Eliminate poorly drained areas, like *Poa annua* growing in areas where water accumulates and is at high risk for rapid freezing during freeze/thaw cycles.

Here's to making it through the winter if you live with the ice.

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