PREPARING GOLF GREENS for winter survival

Photo: Agnar Kvalbein

Introduction

Winter survival of grass on golf greens is, first of all, dependent on weather conditions. As such, there are many variables that are beyond the control of the greenkeeper. Local knowledge of the climate, however, provides a good indication of what type of winter injuries you can expect on your course.

There will always be some greens on a golf course that are more at risk for winter injury for a variety of reasons including water collection from the surrounding area, shade, extended snow cover, exposure to freezing temperatures and desiccation and for many other reasons.

This fact sheet focuses on what you can do in the autumn to improve the turf grass' chances for survival. Other fact sheets will explain the different types of turf injuries, grass species and varieties for severe winter climates and the use of protective winter covers.

Summary

Autumn preparations on golf greens:

- Improve light conditions and air movement
- Avoid compacted greens
- Prevent surface water on the greens
- Apply proper amounts of fertilizer and use fungicides within the limits of local legislation and club policy.

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Construction and long term maintenance

Every winter provides an evaluation of the quality of the green construction and the greenkeeper's work over the last few years.

A sufficient number of air filled pores in the soil, no thatch layering or dry patches and a green surface with an even sward composition dominated by species and varieties that are well adapted to the winter climate are all important for winter survival.

Sand based greens will usually contain more air than up dressed soil greens and some greenkeepers, who have both types, experience a large difference in winter injuries between these types.

Light and air humidity

Autumn light conditions in the Nordic countries are characterized by short days and the low angle of the sun. Light is important for the acclimation of grass plants to winter stresses and grass that grows in the shade during the autumn will therefore be more poorly acclimated and hence less winter stress tolerant. This is a very important factor and golf course architects must take into consideration the low angle of the sun at northern latitudes.

The chain saw is one of the most important tools for greenkeepers who aim to improve winter survival of their turf. Fewer trees will also improve air movement and reduce humidity and thereby lower the risk of disease.

Air pores in the soil

The air content in the soil can be critical when ice builds up on the green surface. Air pores are not primarily produced by hollow coring or aeration in the autumn, but are a result of many years of proper dressing and maintenance throughout the whole season.

Normally free soil water drains unrestricted through the soil profile. When temperatures fall below zero and the soil freezes, the process changes. Winter rain or melting water can fill the soil pores and cause ice encasement of the grass crowns. The ice creates a barrier for gas exchange and, over time, the depletion of oxygen and accumulation of toxic gasses can be severely damaging and even fatal for grass plants.

A plastic cover may prevent ice encasement, however, plastic covers also limit gas exchange. The use of winter protective covers is discussed in another fact sheet.

Winter disease fungi are also aerobic organisms and several observations confirm that winter diseases are more frequent on the driest parts of the greens. In the southern part of Scandinavia, winter diseases are more common than ice encasement.

On golf courses that don't use fungicides, there is an argument for not aerating in the late autumn. However, we generally recommend deep aeration in the autumn because we believe that this can allow water to pass the frozen soil layer in the green and drain.

An asphalt cutter used to restore a drain out of the green. Photo: Ole Albert Kjøsnes, Byneset golf.

Deep aerated green. Photo: Agnar Kvalbein.

Surface water control

Temporary water fences. Photo: Agnar Kvalbein.

A. Reshaping the green

Many greens have insufficient water runoff and water will pool when the green is frozen. The turf at these low spots is very susceptible for winter damage due to the higher risk of ice encasement.

Permanently improved surface water runoff can be achieved by reshaping the green. In low spots, the turf should be cut by a turf-cutter, rolled off, filled with compatible soil mixture, compacted and re-turfed.

The un-turfed area should be considerably larger than the low spot to allow soft curves and nice undulations on the reshaped green. Some greenkeepers are afraid that thicker root zone mixture on a USGA green will make this area drier. Normally this is a minor problem compared to the winter damage and the soil water content can be regulated by increasing the content of fine or organic material in the added growth material.

Parts of the green edge can also be lowered in order to prevent water from freezing on the green, but a maximum 10 cm of the root zone material should be removed from an old USGA green. Lowering parts of a green can be complicated and expensive if the green bottom, drain and gravel, must be reconstructed.

B. Temporary ditches

Some greenkeepers have good experience with digging temporary open drains in the greens that lead surface water away from the green. Turf can be stored in dry parts of the rough on tarps. (Bunkers can be used as storage, but the snow melts later in the spring.) Sometimes these ditches will fill with water and freeze over during the winter. Restoring them with an asphalt cutter can be necessary if the ice builds up.

Some greenkeepers also use the hole cutter to allow the free movement of water down through the gravel on low spots on the green.

C. Interception of incoming water

Large amounts of water can come from the surroundings to the green if the architect has not prescribed a semi-open ditch on the upper part of the green. Installing such ditches is sometimes difficult and temporary water fences can be set up in the autumn to lead the water around the green. Keep these fences low to prevent shade on the green. High fences can also affect the snow depth.

D. Remove soil outside the green

In many cases the problem with pooling water is caused by frost heave on the outside of the green. Water freezes in horizontal ice layers in soil profiles containing silt and clay, causing greater vertical expansion of the soil than the 9% we would normally expect when water freezes. In the dryer green soil, the freezing pattern is different and the ice crystals expand into the air pores. This difference in soil physics between the green and the surroundings can create considerable dams and large ponds. To avoid this, it may be necessary to build an outlet for water by replacing a deep layer of soil with sand.

Green with insufficient water runoff where water will pool when the green is frozen. Photo: Agnar Kvalbein

Mowing height

It seems logical that the mowing height should be increased in the autumn to improve photosynthesis when the sun angle decreases.

Experiments on several Nordic greens have indicated that increased mowing heights could be beneficial for annual meadow grass and for red fescue, but not for bent grasses. It may be beneficial to raise the mowing height at locations that rarely receive stable snow cover, to protect the grass crowns from desiccation.

Winter diseases attack the green fringe more than the low cut greens. Higher cutting height might therefore lead to increased fungicides usage (see later).

Fertilization

There is a tradition of applying a high amount of potassium to turf grass in the autumn. Potassium controls many processes in the plants and is an important nutrient but there is no evidence that extra high rates will improve the winter survival of turf. Also extra rates of other nutrients (e.g. Sulphur, Calcium) are recommended by some but so far the effects have not been scientifically proven.

Late autumn fertilization (close to snow or freezing) with a small amount of nitrogen (20 kg/ha) is reported to improve the spring performance of the turf without compromising the winter tolerance. However, nitrogen has a significant effect on leaf growth - also in the autumn. High rates of nitrogen will extend the growing season and reduce the acclimation of the plant. There are ongoing experiments to determine the optimal fertilization rates in the autumn. Until they are concluded, we recommend that you reduce the fertilizer rates from the end of August until the frost or snow is expected. In this period the nitrogen rate for creeping bent grass and annual meadow grass should not exceed a total of 5 kg/hectare. Use a complete, balanced fertilizer.

Attack from *Microdochium nivale* becomes more severe when the fertilizer rate is high. Greenkeepers who do not use fungicides should take this into consideration.

Many greenkeepers have good experience with applying high rates of iron sulphate in the autumn. The positive effect of this was recently confirmed by experiments on annual meadow grass greens in Oregon. Biweekly applications (96 kg/ha) reduced the microdochium patches to less than 2% compared to untreated which had more than 50%. Be aware that high rates of iron sulphate can harm the grass and create a black layer on greens that have drainage problems.

Effect of late autumn fertilization was tested at Bjaavann golf course. Photo: Terje Haugen.

Application of fungicides

Some grass species, like annual meadow grass, creeping bent grass and brown top bent grass, are very susceptible to winter diseases like pink and grey snow mould (*Typhula* sp).

Modern fungicides can effectively control these diseases but their usage may be restricted due to environmental regulations or the risk of developing resistant pathogens. Several fungicide trials have been conducted in the Nordic countries. They are summed up as follows:

- One application of a systemic fungicide in the autumn when the turf is still growing in October reduced the snow mould attack in the spring by 60-70%. Following up with a contact fungicide 3 weeks later improved the control to 95%. A third application gave 100% control and improved the green colour in the spring. Read the labels carefully to see how many applications you may make per season.
- Some biological products have been tested, but they have not been proven to have any effect on winter diseases under field conditions.
- Phosphite, which had been used as a pesticide, has been on the market as a fertilizer for some years. Applied on its own, this chemical had little effect on winter diseases and cannot be recommended.

Autumn at Losby golf. Photo: Agnar Kvalbein.

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Read more

Aamlid, T.S., W.M. Waalen & T. Espevig 2014. Fungicide strategies for the control of turfgrass winter diseases. Acta Agriculturae Scandinavica, Section B — Soil & Plant Science 62: 113-121.

Espevig, T. & A. Kvalbein (eds.): Turf grass winter survival. Book of abstract from international seminar 11-12 November 2014. Bioforsk Fokus 9 (8): 10-11.

Kvalbein, A. & T.S. Aamlid 2012. Impact of mowing height and late autumn fertilization on winter survival and spring performance of golf greens in the Nordic countries. Acta Agriculturae Scandinavica Section B Soil & Plant Science 62 (Supplement 1): 122-129.

Mattox, Clint (2015) Managing Microdochium Patch Using Non-Traditional Fungicides on Annual Bluegrass Putting Greens. Master of Science thesis in Horticulture, Oregon State University.

STERF (Scandinavian Turfgrass and Environment Research Foundation) is the Nordic golf federations' joint research body. STERF supplies new knowledge that is essential for modern golf course management, knowledge that is of practical benefit and ready for use, for example directly on golf courses or in dialogue with the authorities and the public and in a credible environ-mental protection work. STERF is currently regarded as one of Europe's most important centres for research on the construction and upkeep of golf courses. STERF has decided to prioritise R&D within the following thematic platforms: Integrated pest management, Multifunctional golf facilities, Sustainable water management and Winter stress management. **More information can be found at www.sterf.org**

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The CTRF is a registered charity with a mandate to raise monies and sponsor research projects that advance the environmental and economic benefits applicable to turfgrass. The CTRF is funded by contributions received from two national and six regional organizations involved in the golf and sports turf sectors. Over one million dollars has been invested in turf research in Canada by CTRF. The Foundation currently has 10 active research projects. Participating organizations include Golf Canada, the Canadian Golf Superintendents Association, the Western Canada Turfgrass Association, the Alberta Turfgrass Research Foundation, the Saskatchewan Turfgrass Association, the Ontario Turfgrass Research Foundation, the Quebec Turfgrass Research Foundation and the Atlantic Turfgrass Research Foundation. **More information can be found at www.turfresearchcanada.ca/**