



*STERF's R&D program on
Integrated Pest Management*

IPM

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STERF's R&D program on Integrated Pest Management (IPM)

The Scandinavian Turfgrass and Environment Research Foundation (STERF) has organized its activities into four research areas, each with a R&D program:

- 1. Integrated pest management (IPM)*
- 2. Turfgrass winter stress management*
- 3. Sustainable water management*
- 4. Multifunctional golf facilities*

The four programs can be downloaded at <http://sterf.golf.se>.

As coordinator for the first of these programs, I would like to give a brief update of STERF activities within IPM. My objective is to present some of the ongoing projects, but also to motivate colleagues to continued efforts towards more sustainable use of pesticides and to more international collaboration within the IPM sector.



STERF' Integrated pest management R&D program.

The first of STERFs research programs

The IPM program was the first of STERFs R&D programs, published in 2010. The background was the EU council directive 2009/128/EU on sustainable pesticides use, which required all member states to set up a national action plan for implementation of IPM not only in agriculture and horticulture, but also for the green amenity sector. STERF took this challenge and developed a web-based IPM library consisting of a

framework description plus 15 fact sheets covering various aspects of IPM management, such as species and variety selection, fertilization, thatch control and information about specific pests and diseases. The factsheets have been downloaded by numerous turfgrass managers in the Nordic countries and are still available at <http://sterf.golf.se>

SCANGREEN: Variety testing focusing on disease resistance and weed competition

In a wider sense, IPM can also be taken as an abbreviation for ‘Intelligent Plant Management’: It is all about growing strong turfgrass plants that are competitive against weeds and resistant to pests and diseases. A key factor is the selection of turfgrass species and varieties that minimize the need for pesticides. STERF has since 2003 funded variety testing on Nordic golf greens^{1,2}, from 2011 called the SCANGREEN program. Variety trials are carried out on USGA-

spec. greens in different climatic zones of Denmark, Iceland and Norway and maintained as closely to actual golf course management as possible, except that they are never sprayed with pesticides. Regular assessments for disease and invasion of weeds and mosses is an important part of this program, and the trial at Landvik, Norway,

has even been inoculated artificially with isolates of *Microdochium nivale*, which is economically most important turfgrass disease in Scandinavia. Results from these trials, including a ranking of varieties for resistance to *M.nivale* and other diseases, are updated every year in January at www.scanturf.org



Guidelines from STERF' red fescue workshop.

Research into more environment-friendly turfgrass species

One of the early conclusions from in the SCANGREEN trials was that red fescue (*Festuca rubra*) is more resistant to *M.nivale* and therefore requires less fungicides than bentgrasses (*Agrostis* sp.) and annual bluegrass (*Poa annua*). Red fescue also requires less water and fertilizer and may – as such – be a good alternative for more environment-friendly and low-input management of golf greens. Apart from the Danish group ‘Sons of golf’ there was little experience with pure red fescue greens in Scandinavia, hence, in 2011, STERF funded the

project FESCUE GREEN with the objective of finding best management practices with regard to mowing height, mowing frequency, rolling frequency, irrigation, seasonal fertilizer distribution and the use of compost as organic amendment to the sand-based rootzone or topdress³. One of the most important questions asked in this project is how to achieve the best playing quality while at the same time avoiding annual bluegrass encroachment on fescue greens. Under its slogan ‘Ready to use research, STERF always requires that

turfgrass managers and other practitioners are actively involved in all phases of the STERF projects, and, in collaboration with R&A, the project FESCUE GREEN therefore started with an international workshop in which more than 20 experienced greenkeepers from eight countries shared experiences. The resultant report, ‘Red fescue management: Guidelines based on greenkeepers’ experiences’, can be downloaded from <http://sterf.golf.se>

Biological control and induced resistance

A recurring topic in IPM is the potential for substitution of chemical fungicides with microbial products that are antagonistic to the turfgrass pathogen and/or with biostimulants that promote overall turf health or induces specific resistance to disease. One of STERF's projects has - for the past three years - evaluated two microbiological products, one containing the fungus *Gliocladium catenulatum* and the other a bacterial product containing *Streptomyces* sp. Depending on tempera-

ture and concentration these products are able to inhibit mycelial growth of *M.nivale* in vitro, but so far, the lack of any consistent effect in field trials on golf courses in Sweden, Denmark and Norway has lowered our expectations that they will lead less use of fungicides in the future⁴.

A new STERF project starting this autumn (2014) is an evaluation of the ability of Civitas - a mineral oil product from Petro Canada - to induce resistance to *M.nivale*

in creeping bentgrass. This is a joint project between STERF and the Canadian Turfgrass Research Foundation (CTRF) which has funded a similar project by our Canadian colleagues Drs. Tom Hsiang and Annick Bertrand. Parallel trials will be conducted in the Nordic countries and Canada, and Civitas will be tested both alone and in combination with phosphite and reduced fungicide rates.

New and more efficient and environment-friendly fungicides



Most of STERF's studies on pesticide and nutrient leaching have been carried out in the USGA-spec. green field lysimeter facility at Bioforsk Landvik, Norway. Photo: Trygve S. Aamlid.

While it may be long-term goal to totally eliminate the use of pesticides on golf courses and other recreational areas, many turfgrass

managers will argue that this is not feasible as it will lead to severe losses in aesthetic and functional turf quality. In the short term, a more

realistic approach may therefore be to select the most efficient pesticide depending on an accurate diagnosis of the weed, disease or insect problem, and/or to replace old pesticides with new chemistries that are less harmful to the environment while having the same effect at lower application rate. Many Scandinavian golf clubs have to report to the environmental authorities their pesticide consumption in terms of total amount of active ingredient per ha per year, and in Denmark there is even a correction factor to be multiplied with each product to document the total environmental impact. Several STERF projects have documented significant differences in the risk for leaching of various fungicides from sand-based golf greens but also how this risk can be minimized by the use of organic amendments or soil surfactants^{5,6,7,8}.



From one of STERF's trials at Österåker GK, Stockholm, testing new fungicides against *M.nivale*. Photo: Magnus Ljungman.

Since 2010 STERF has been evaluating fungicides from Syngenta for the control of turfgrass diseases and from 2013 this collaboration was formalized as Syngenta Lawn and Garden entered STERF's industrial partnership program. Together with documentation from other sources, this testing has resulted in fungicide formulations developed specifically for turf coming to the market in replacement for agricultural formulation of old substances such as thiophanatemetyl, bitertanol or iprodione. Iprodione, which for many years was scrutinized by the authorities due its high

toxicity to aquatic organisms and because STERF projects showed it to be prone to leaching from sand-based golf greens^{5,8}, has now been withdrawn for the market in all of the five Nordic countries. In Sweden the use of iprodione against *M.nivale* shortly before snowfall in late autumn has mostly been replaced by fludixonil (Medallion) which in our trials exerted the same amount of control but with less than 10 % use of active fungicide ingredient⁹.



White Clover, *Trifolium repens*

Weed control on fairway

More than 50 % of the total pesticide consumption on Nordic golf courses (in Denmark almost 75 %) is herbicides used for the control of broadleaved weeds on fairways. This is also what many greenkeepers fear the most, namely that a total ban in pesticide use will lead to an escalation in the populations of *Bellis perennis*, *Plantago major*, *Trifolium repens*, *Taraxacum* sp. and other perennial weeds on fairways. A review paper presented by Jensen et al. at the 4th ETS Conference in Germany this sum-

mer10 showed that STERF projects aiming for an overall reduction in weed occurrence by mechanical or thermal means have mostly been unsuccessful, as the weed species have different biology and react differently upon the different treatments. Many of these treatments are also very labor- and energy intensive, which may have a strong impact on the carbon footprint from many golf courses. Rather than harrowing, verticutting or flaming all fairways, mechanical and thermal treatments there have to be

targeted and differentiated to the predominant weed species in each area. There is also a need for more in-depth research into the biology and persistency of various weed species at fairway mowing height and frequency¹⁰.

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