



Risk of DOLLAR SPOT

**on Norwegian
golf courses**

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Photo 1. Dollar spot symptoms on a golf green. Photo: T. Espevig

Risk of dollar spot on Norwegian golf courses

Dollar spot was officially documented in Norway in 2013 and in Sweden in 2014. In Denmark, the disease has been seen for at least 10 years. As far as we know, the disease exists on at least 20 golf courses in the Nordic countries. On some Nordic courses and for some years the damage from dollar spot is severe (up to 70-80% dead grass on greens and fairways). Even in the cases when disease pressure is low, the diseased turf is repaired very slow and this leads to uneven playing surface and a significant reduction of the playing quality. Genetic analysis of the local dollar spot isolates revealed that several of them are different from those in the United States and that they probably belong to a new species / subspecies. There is little knowledge of environmental conditions that is beneficial

for this disease in Scandinavia and there is no available information on resistance to dollar spot in turfgrass species and cultivars that are used on Scandinavian golf courses. In Norway (also in Denmark), the use of fungicides against dollar spot is not permitted, so it is important to have knowledge and experience about the most effective cultural methods against dollar spot.

About the disease

Dollar spot is a common foliar disease of turfgrasses, that causes damage in the United States, continental Europe and Australia (Photo 1). After dollar spot was officially documented in Norway and Sweden (Espevig et al. 2015, 2017), the disease has been in the

focus of research through the projects funded by STERF and other actors (www.sterf.org).

Dollar spot is caused by a fungus that in 1937 was defined as *Sclerotinia homoeocarpa*. After 75 years of arguing that the fungus may have been misplaced and where it really belongs, US scientists have recently published a scientific work showing that *S. homoeocarpa* is not a species of *Sclerotinia* but of *Clariireedia* which was introduced as a new genus (Salgado-Salazar et al., 2018). This new genus currently consists of four species: *Clariireedia homoeocarpa*, *C. bennettii*, *C. jacksonii* and *C. monteithiana*. All four fungal species cause dollar spot symptoms. Authors claim that while *C. bennettii* occurs primarily on red fescue (C3 grass) and appears to be

restricted to the United Kingdom, *C. jacksonii* and *C. monteithiana* occur in a variety of C3 and C4 grass species and appear to be globally widespread. Earlier experiments at NIBIO, using DNA analysis, showed that the Scandinavian isolates (fungal samples) of the dollar spot belonged to two genetic groups: one group consisting of the Danish and most Swedish isolates was identical to the one from the East and Midwest in the United States, namely *C. jacksonii* while the other group consisting of the Norwegian and some Swedish isolates differed. Already then, we thought that this other group could be a separate species or subspecies. And now that we know that dollar spot can be caused by different fungal species, we should find out where our local isolates belong and which *Clariireeda* spp. we have in the Nordic countries.

Dollar spot can grow and attack grass at low temperatures

A common assumption for many years has been that dollar spot cannot be in the Nordic countries as it requires a warmer climate.

The Swedish student Anita Ejderdun previously worked with dollar spot isolates which were collected from the Nordic countries. Among other things, she looked at the ability of dollar spot to attack creeping bentgrass at 6 ° C, 15 ° C and 24 ° C in a pot trial. Surprisingly her study shows that the fungus samples tested were more active at 6 ° C and / or 15 ° C than at 24 ° C (Ejderdun, 2015).

The recent laboratory study which was conducted at NIBIO's laboratory at Landvik in the fall of 2017, showed that all tested dollar spot isolates from different countries (1 from Denmark, 1 from Norway, 3 from Sweden, 4 from the United States and 2 from the UK) had 24 ° C as the optimum temperature for growth as pure culture in Petri plates (Entwistle et al., 2018). The maximum growth temperature for most isolates in this study was between 32 and 40 ° C which was higher than previously reported by Bennet (1937). Minimal temperature for fungal growth was between 0 and 2 ° C and all fungal isolates could regrow after being at 0 ° C for 3 weeks. No reduction in growth rate was recorded for either the USA isolates collected from cool-season grasses, or the

Norwegian isolate. The growth rates of isolates from Denmark, Sweden and UK were reduced by an average of only 28% when compared to their growth at 16 ° C prior to chilling. It appears that the lack or low inhibition in growth for several isolates could indicate a potential for enhanced survival during cold winter conditions but further work is necessary to confirm this.

Rolling as an important preventive measure against dollar spot

Rolling is known to reduce dollar spot (e.g. Giordano, 2012). In the new STERF dollar spot project we tested the effect of rolling on greens on two golf courses in Denmark, two in Sweden and one in Norway. The results from Sweden are very strong and show that regular rolling in the growing season from June to September 2017 reduced dollar spot significantly. On average, for August-September 2017, the dollar spot was reduced 61% by rolling 2 times per week and 95% by rolling 4 times per week on a pure fine fescue golf green



Photo 2. Rolling 4 and 2 times per week from June to September reduced dollar spot by 95% and 61% respectively as compared with the control (no rolling) on a fine fescue golf green in Vallda GC, September 7, 2017. Photos: Stefan Nilsson.



Photo 3. Lab screening of turfgrass species and cultivars for resistance to dollar spot isolates of different origin. Photos left and middle by Tatsiana Espevig and photo right by Ove Hetland.

in Vallda GK (Photo 2). In Roskilde GK in Denmark, on a foregreen with a mixture of fine fescue and colonial bentgrass dollar spot was reduced 37% by rolling 2 times per week and 54% by rolling 4 times per weeks on average for September and October, however the reduction was not statistically significant. In 2018, dollar spot did not develop on these experimental golf greens most likely due to an extreme dry summer. Nevertheless, even during dry summer rolling can be recommended for use with great advantage. Rolling will also improve ball roll on greens and contribute to an increase in soil moisture (dollar spot is known to thrive best when combined with dry soil and a lot of moisture on the foliage (Smiley et al., 2005).

Nitrogen (N) fertilization

From previous studies in the USA where dollar spot has been studied for at least 50 years, it is known that this disease can become more severe with low N fertilizer (Landschoot and McNitt, 1997) and low cutting height

(Dernoeden, 2000). In our dollar spot project, N effect was tested on one Danish, one Swedish and one Norwegian golf course. In Drammen GK (Norway), dollar spot did not develop in summer 2017 or 2018. In 2017, the effect of N was not statistically significant at Helsingør GK in Denmark and at Kävlinge GK in Sweden. In 2018, we got 24% less dollar spot on a creeping bentgrass green in Kävlinge GK by increasing the amount of nitrogen from 150 to 240 kg ha⁻¹ kg per year. However, in March 2019 on the plots, which received 240 kg N ha⁻¹ in 2018, the microdochium patch incidence was 30% vs. 14% on the plots which received 150 kg N ha⁻¹. Thus, it is impossible to draw unambiguous conclusions about the advisability of using increased doses of N to fight dollar spot on golf greens which are exposed to microdochium patch during winter time.

Resistant turfgrass species and cultivars

Dollar spot affect all turfgrasses but the resistance to dollar spot varies

among turfgrass species and cultivars. It is also a question whether the different Nordic isolates are equally aggressive as American or British isolates and whether there are any differences among the Nordic isolates. In the spring of 2018, 20 of the most widely used grass species and cultivars were tested for resistance to 10 different dollar pot isolates from Norway, Denmark, Sweden, the United Kingdom and the United States in the laboratory at NIBIO Landvik (Photo 3). This experiment was carried out at temperatures equivalent to a Norwegian summer with 16 ° C night and 21° C day. The preliminary results show that in average for all isolates the rankings of the species' resistance to dollar spot were as follows (from most to least resistant): ryegrass > red fescue ≥ Kentucky bluegrass ≥ velvet bentgrass ≥ creeping bentgrass & colonial bentgrass & annual bluegrass. There was a big variation among the cultivars especially of colonial bentgrass and Chewings fescue. The most aggressive isolates were one from the United Kingdom and two from the United States, while the weakest were the Norwegian and the other from

the United Kingdom; isolates from Denmark and Sweden were in the middle. The trial was repeated in the spring 2019 and more results will be published later on.

Testing of fungicides against dollar spot

Chemical control of dollar spot can be difficult in the Nordic countries due to very limited access to fungicides. At present, there is perhaps no big need for fungicides against dollar spot in Norway compared with Sweden and especially Denmark, as there are few golf courses in Norway that have dollar spot. In addition, preliminary results from the lab screening show that the Norwegian isolate is not as aggressive as the other isolates. Still, due to climate changes and new sources of infection, things can change and cause more serious damage and spread of dollar spot. Therefore, research is needed to find out which fungicides are effective and can be used. In 2017, we did not receive funding from

STERF for such an evaluation. The STERF Board wanted this to be financed by the industry and the national golf federations which in turn were not able to finance the project since they considered the market to be small. According to Torben Kastrup, the Danish Golf Union took an important step in 2018 and planned to test selected fungicides in the field. Torben Kastrup says: "It is not an easy matter, because we have the challenge in Denmark that we have an upper limit for how many pesticides we are allowed to use. It is a problem that we want to address if it becomes relevant. Basically, we should have a sense of whether we have any products that are effective in practice".

Disease analysis

Usually, dollar spot is active from May to October with the greatest development and most damage in August-September. The summer 2018 was abnormally warm but very dry which caused the dollar spot not to develop

as much as in 2017. Nevertheless, the potential for the development of the disease in late August and September is high. We would like to know more about courses that have or get dollar spot. So feel free to contact national diagnostic laboratories (www.nibio.no/turflab, knp@nyholt.dk, botaniskanalys@botaniskanalys.se).

Collaboration with golf courses

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References

- Bennett F.T. 1937. Dollarspot disease of turf and its causal organism, *Sclerotinia homoeocarpa*. *Ann. Appl. Biol.* 24:236-257.
- Bonos S.A., R.J. Buckley, and B.B. Clarke. 2007. An Integrated Approach to Dollar Spot Disease in Turfgrasses. Cooperation Extension fact sheet. Rutgers New Jersey Agricultural Experiment Station. p.1-3.
- Dernoeden, P. H. 2000. Dollar spot: Getting tougher to manage in creeping bentgrass. *Turfgrass* 8:2-6.
- Ejderdun A. 2015. Riskbedömning av skandinaviska isolat av *Sclerotinia homoeocarpa* vid olika klimat (in Swedish). BSc thesis. Mathematics and Natural Sciences University of Gävle, Sweden. 47 p.
- Entwistle K., T. Espevig, J. A. Crouch, K. Normann and M. Usoltseva. 2018. The effect of temperature on the in vitro growth rate of *Sclerotinia homoeocarpa* isolates of different origin. p. 14-15. In S. Brown et al. (ed.) Different shades of green. *Eur. Turfgrass Soc. Conf.*, 6th, Manchester, UK. 2-4 July 2018. *Eur. Turfgrass Soc.* Quinto Vicentino, Italy.
- Espevig T., M. B. Brurberg and A. Kvalbein. 2015. First Report of Dollar Spot, Caused by *Sclerotinia homoeocarpa*, of Creeping Bentgrass in Norway. *Plant Disease* 99:287.
- Espevig T., M. B. Brurberg, M. Usoltseva, Å. Dahl, A. Kvalbein, K. Normann, and J. A. Crouch. 2017. First report of dollar spot disease, caused by *Sclerotinia homoeocarpa*, of *Agrostis stolonifera* in Sweden. *Crop Sci.* 57:349-353.
- Giordano, P.R., Nikolai, T.A., Hammerschmidt, R. and Vargas, J.M. Jr. 2012. Timing and frequency effects of lightweight rolling on dollar spot disease in creeping bentgrass putting greens. *Crop Science.* 52: 1371-1378.
- Landschoot P. J., and A.S. McNitt. 1997. Effect of nitrogen fertilizers on suppression of dollar spot disease of *Agrostis stolonifera* L. *Int. Turfgrass Soc. Res. J.* 8:905-911.
- Salgado-Salazar, C., L.A. Beirn, L. Ismaiel, M.J. Boehm, I. Carbone, A.I. Putman, L.P. Tredway, B.B. Clarke, and J.A. Crouch. 2018. *Clariireedia*: A new fungal genus comprising four pathogenic species responsible for dollar spot disease of turf grass. *Fungal Biol.* 122:761-773.
- Smiley R. W., P.H. Dernoeden, and B.C. Clarke. 2005. *Compendium of Turfgrass Diseases*. APS Press.
- Walsh B., S.S. Ikeda and Boland G.J. 1999. Biology and management of dollar spot (*Sclerotinia homoeocarpa*): an important disease of turfgrass. *HortScience* 34:13-21.