

# Experimental results and practical experiences with velvet bentgrass (*Agrostis canina*) on golf courses in the Nordic countries

An update from the STERF project 'VELVET GREEN', 2007-2010.

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Velvet bentgrass is a native species to north and central Europe, including Scandinavia. It grows from lowlands to alpine levels, particularly on acid and wet soils. Turfgrass varieties of velvet bentgrass mostly originate from 'South German' bent, germplasm that was taken by emigrants to North America in the late 1800s. After decades of ignorance due to focus on creeping bentgrass, there is now new interest in velvet bentgrass for North American golf courses, particularly on the north east coast. Over the last 15 years, many new varieties have been released, most of them from the turfgrass breeding program at Rutgers university. Apart from ten to fifteen courses in Finland, few Scandinavian golf courses have seeded velvet bentgrass in the past.

The initiative to a STERF project on velvet bentgrass arose from the STERF-funded variety trials on USGA greens at the Norwegian research stations Apelsvoll (61°N, 250 m a.s.l.) and Landvik (58°N, 10 m a.s.l.) 2003-2006. In that project, velvet bentgrass not only produced the densest, finest and most uniform turf, but it also survived three months of ice cover at Apelsvoll better than any other species (Photo 1). Other advantages of velvet bentgrass often mentioned in the literature are better shade tolerance and better drought tolerance than creeping bentgrass.



*Photo 1.*

*Only velvet bentgrass (green plots to the left) came out of the winter 2004/05 with hardly any winter damage at Apelsvoll. To the right: Creeping bentgrass.*

*Photo: Bjørn Molteberg*

The main challenges related to velvet bentgrass on Nordic golf greens are thatch control and tolerance to various types of winter hazards: freezing stress, water, ice and snow cover and winter diseases. Thus, our project is centred around these aspects. Experiments are carried out both in controlled environments (greenhouses, freezing chambers etc.) and on the experimental greens at Bioforsk Landvik and Apelsvoll. By the end of the project in December 2010, Tanja Espevig, will defend her Ph.D. thesis on these data. Most importantly, turfgrass agronomists, scientists and about ten greenkeepers evaluating velvet bentgrass 'in practise' on their courses in Finland, Sweden, Denmark and Norway constitute the project's reference group which meets once a year to discuss establishment and maintenance of this grass species. The 2009 meeting was held on 9 June at Apelsvoll (Photo 2).



**Photo 2. Velvet Green reference group on experimental green at Apelsvoll, 9 June 2009.  
Photo: Agnar Kvalbein.**

### **Velvet bentgrass winter tolerance**

Three trials comparing the freezing (low temperature) tolerance of the velvet bentgrass varieties 'Avalon', 'Vesper', 'Villa', 'Greenwich' and 'Legendary' with that of creeping bentgrass 'Penn A-4' (control) have now been completed. Plants have been seeded, raised in pots and hardened at various temperature and light conditions before being exposed to freezing temperatures down to  $-15^{\circ}\text{C}$  for 24 hours. None of these trials have revealed any significant differences in freezing tolerance between velvet bentgrass and creeping bentgrass or among velvet bentgrass varieties. For both species, the ability of golf greens without snow cover to tolerate low temperatures seems depend on hardening conditions (Photo 3a-d). Data obtained by Tanja Espevig during her four month studies at Rutgers University, USA, from January to May 2009, are now being analysed to better understand the physiological mechanisms for this tolerance.

As for other types of winter hazards, preliminary data suggest that velvet bentgrass is more susceptible to pink snow mould (*M. nivale*) and/or simulated snow cover, than creeping bentgrass 'Penn A-4'. This research will be repeated during the winter 2009-10, and a new trial set up to clarify if there is differential tolerance also to extended ice encasement, as suggested by the early results from the experimental green at Apelsvoll.

### **Thatch control on velvet bentgrass greens**

Field trials with velvet bentgrass 'Legendary' were initiated at Landvik and Apelsvoll in June 2007 according to the following experimental plan (Photo 4)

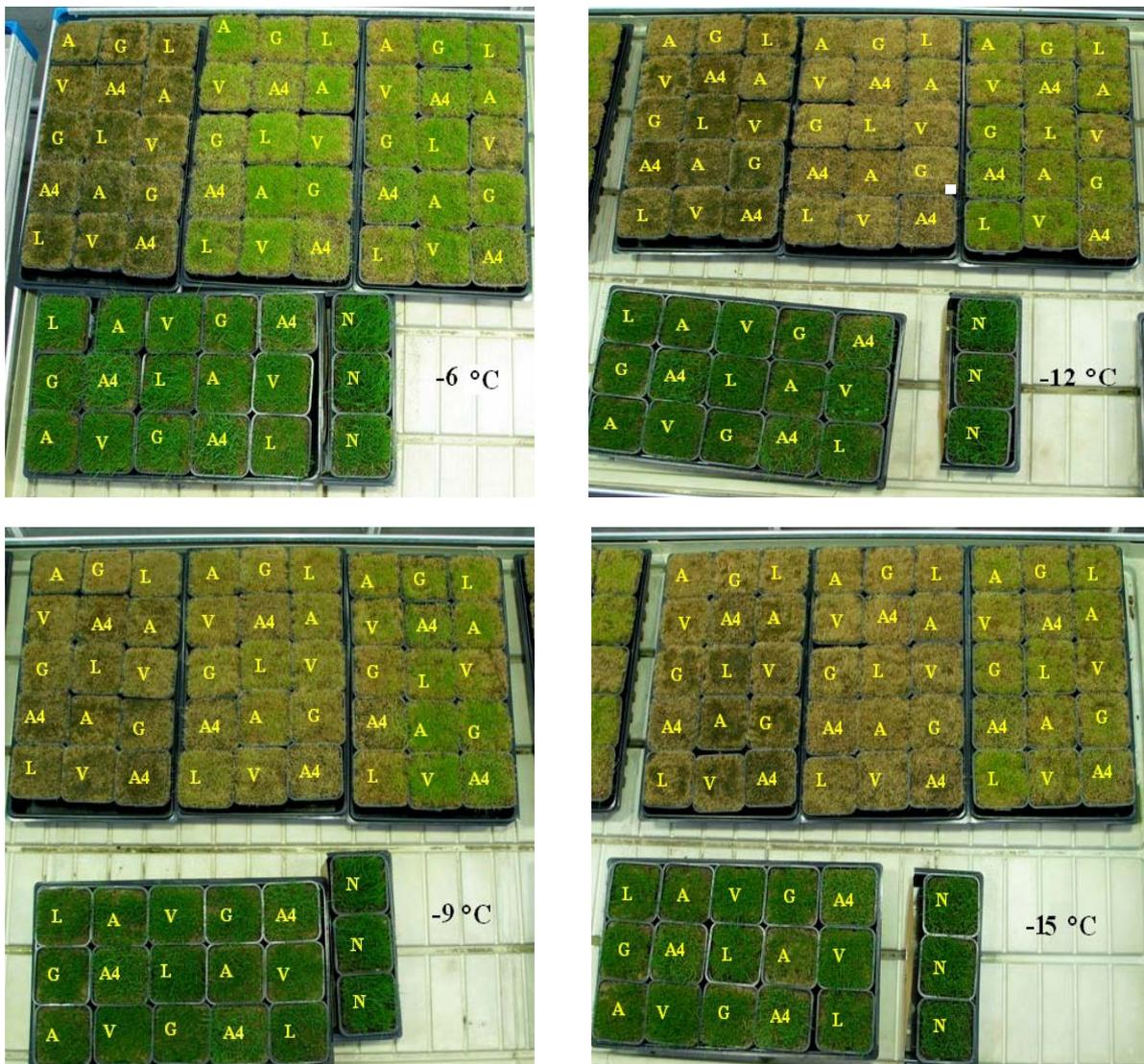


Photo 3. Recovery of plants 26 days after exposure to freezing temperatures, 2008-09: (trays in top row on each photo, left to right) unhardened plants, hardened 2 wk at +2 °C, hardened 2 wk at +2 °C followed by 2 wk at -2°C; (bottom row) plants hardened in field. A=Avalon, G=Greenwich, L=Legendary, V=Villa, A4=Penn A-4, N=Nordlys (Photo: Arne Tronsmo)

**Factor 1: Fertilizer level (main plots)**

- A. 0.75 kg N/100 m<sup>2</sup>/yr
- B. 1.50 kg N/100 m<sup>2</sup>/yr

**Factor 2: Mechanical / biological methods for thatch control (main plots)**

1. Grooming to +/- 0.1 mm depth once a week (groomer mounted on mower)
2. As 1 + verticutting to 2 mm depth once a month
3. As 1 + spiking with 8 mm solid tines once a month
4. As 3 + the addition of the biological product "Thatch less™" (100 ml product diluted in 7.5 litre water per 100 m<sup>2</sup>) after each spiking (only at Landvik)

**Factor 3: Topdressing with straight sand without organic matter (subplots)**

- i) 0.5 mm every two weeks
- ii) 1.0 mm every two weeks



Photo 4. Experimental velvet bentgrass green with various fertilizer rates and topdressing levels, Landvik October 2008.

After the grow-in year 2007 and the first green year 2008, the preliminary results from these trials can be summarized as follows:

- The problem with organic matter accumulation is far worse in coastal areas with a long and wet growing season (Landvik) than in inland areas with a shorter and dryer season and possible growth reductions due to winter damage (Apelsvoll). During period June 2007 – September 2008, per cent organic matter in the top 10 mm (thatch/mat layer) on the green Landvik increased from 2.0 to 5.5 – 9.5 % (w/w) depending on treatments. More organic matter in the top layer resulted in softer greens with reduced speed.
- Velvet bentgrass greens should receive at least 1.5 kg N/100 m<sup>2</sup> (0.06-0.08 kg N/100 m<sup>2</sup>/wk) in the grow-in year and corresponding amounts during repair after winter damages, but it is important to back-off, perhaps to a rate corresponding to 0.75 kg N/100 m<sup>2</sup> (0.03-0.04 kg N/100 m<sup>2</sup>/wk) as soon as turf coverage is complete.
- Vertical mowing every two to three weeks seems to be a good way of reducing thatch on velvet bentgrass greens. Other mechanical methods / combinations should be explored. Spiking with hollow or solid tine should be accomplished once or twice per year to improve infiltration.
- The amounts of topdressing sand needs to be adjusted depending on length of growing season, irrigation and fertilizer rate. In coastal areas, velvet bentgrass courses should have a budget for at least 15 kg fine sand per m<sup>2</sup> per season.
- Despite being applied regularly in conjunction with spiking, topdressing and irrigation, the biological product 'Thatchless' had no effect in these trials

#### **Practical experiences with velvet bentgrass on a Nordic golf course**

Samuelsdals GK, Falun, Sweden. Greenkeeper: Michael Lagestam

Samuelsdals GK is located at a latitude of 60°34'N, in a fairly winter-tough area and with a annual precipitation of about 600 mm. Six new / renovated greens plus a practice green were seeded with velvet bentgrass 'Avalon' in 2006 and opened 30 June 2007. The rootzone was USGA sand with 20% (v/v) peat. The other (old) greens on the course are covered with *Poa annua*.

Maintenance practices in 2007 and 2008 were as follows:

- Mowing heights: 3,5–5 mm
- Mowing frequency: 3 times/week , rolling on alternating weekdays. Neither mowing nor rolling during weekends. Very low clipping yields.
- Demand-driven fertilization < 1 kg N/100m<sup>2</sup>/år. Weekly rates never exceeding 0.06 kg N/100m<sup>2</sup>.
- Weekly light topdressing, total seasonal amount 10 mm.
- Weekly spiking (slicing with knives)
- Verticutting 4 times/year
- Verti Drain: 8 mm, cross tines and 10 mm hollow coring
- Rolling 2 times/week

This maintenance practice resulted in excellent greens in 2007. However, in spring 2008, two out of seven greens suffered winter injury and had to be reseeded. The recovery period was very long and green quality not acceptable until August. Slow repair is considered a disadvantage of velvet bentgrass.

During the winter 2008-09, the velvet bentgrass greens were all covered by ice for a long period. Gas was building up under the ice. The ice was melted using urea, but this nitrogen fertilizer also stimulated growth and dehardening of many velvet plants during subsequent frost periods. In the spring 20-25 % of the turf was dead. In spring 2009, reseeding has been accomplished using a mixture of *Poa trivialis* and velvet bentgrass. The idea is that *Poa trivialis*, as a nurse crop, will germinate quickly and provide a playing surface until velvet bentgrass takes over. Fertilizer rates during the repair phase have been raised to 0.95-1.20 kg N / 100 m<sup>2</sup>. As of 9 June 2009, this strategy seems to have been very successful.



***Photo 5.***

***Velvet bentgrass green at Samuelsdal GK.***

***Photo: Micke Lagestam.***

Despite the apparent lack of winter hardiness, head-greenkeeper Micke Lagestam is satisfied with velvet bentgrass and thinks he has found a good way of maintaining it on his course. –It is much better than *Poa annua*, which predominate the other greens on the course, he says.