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## Evaluation of turfgrass varieties for use on Scandinavian golf greens, 2007-2010

Results from the sowing year 2007 and the two  
first green years 2008 and 2009

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Evaluation of turfgrass varieties for use on Scandinavian golf greens, 2007-2010. Results from the sowing year 2007 and the two first green year 2008 and 2009

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*Sammendrag:*  
Dette er en rapport med resultater fra såingsåret 2007 og de to første greenårene 2008 og 2009 i et prosjekt med testing av grassorter til bruk på skandinaviske golfgreener. Hele prosjektperioden er 2007-2010.

*Summary:*  
This report gives results from the sowing year 2007 and the two first green years 2008 and 2009 in a project evaluating turfgrass varieties for use on Scandinavian golf greens. The total project period is 2007-2010.

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# 1. Abstract

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Due to fungicide restrictions, harsh winters and the light/temperature conditions at high latitudes, turfgrass variety testing in USA, UK or central Europe has limited relevance for Scandinavia. Evaluation of turfgrass varieties for use on Scandinavian golf greens started in 2007 for the period 2007-2010. Four trials were established on greens constructed according to USGA standard at Östra Ljungby Naturgymnasium, Sweden, and Bioforsk Landvik, Norway, in climate zone 1 (southern, mostly coastal regions); and at Bioforsk Apelsvoll, Norway, and Keldnaholt Golf Course, Iceland, in climate zone 2 (northern, mostly continental regions with stronger requirements to winter hardiness).

A total of 42 varieties of seven species and subspecies were entered into the project. The trials were established according to a split plot design with the species chewings fescue (FRC), slender creeping red fescue (FRT), velvet bentgrass (ACAN), colonial bentgrass (ACAP), creeping bentgrass (AS), rough-stalked meadow grasses (PT) and perennial ryegrass (LP) on main plots and varieties on subplots.

The experiments at Apelsvoll and Landvik were mowed at least three times per week to a height of 5 mm for LP, FRC, FRT and PT and 3 mm for the bentgrasses. The mowing height at Keldnaholt was 5.5 mm for all species. The trials were rated at monthly intervals for visual merit (overall turfgrass quality) and other characters.

As the trial at Östra Ljungby had to be closed in 2009, only results from Landvik (zone 1) and Apelsvoll and Keldnaholt (zone 2) are presented:

Especially the first winter in the project discriminated strongly among species and varieties. **On average for varieties within species**, FRC and FRT had significantly better winter survival than ACAP, ACAN and AS, LP and PT in both zones. In zone 2 the fescues were at the top for overall turfgrass quality, only accompanied by ACAN at Apelsvoll and LP and PT at Keldnaholt. The ranking for overall quality in zone 1 was ACAN>FRC>AS>FRT>ACAP>PT>LP.

Different varieties of **ACAP** have to be used in zones 1 and 2. **'AberRoyal'** and **'Greenspeed'** (TAT 720) had higher scores than the control variety **'Jorvik'** in zone 1, while the control variety **'Leirin'** was unsurpassed in zone 2.

The control variety **'Villa'** of **ACAN** had better winter survival and overall score than **'Vesper'** and **'Legendary'** at Apelsvoll. Differences among these varieties were small at Landvik and Keldnaholt.

Within **AS**, **'Declaration'** and **'Runner'** ('IS AP 14') 'appeared to be good alternatives to the control variety **'Independence'** in zone 1. **'CY-2'** performed well at both sites in zone 2, although it was clearly inferior to **'Norwegian type'** (previously called 'Nordlys'; really a mix of AS and ACAP) with regard to winter survival at Apelsvoll.

**'Musica'** had higher overall scores than any other **FRC** in zone 1 and at Apelsvoll in zone 2. Other **FRC** better than the control variety **'Center'** in zone 1 were **'Barswing'**, **'Greensleeves'** and **'Margret'**. **'LøRc 0215'** had the best score at Keldnaholt.

Within **FRT**, **'Finesto'** (Frt 04213), **'Viktorka'** and **'Amarone'**, had high scores in zone 1. **'Viktorka'** and **'Amarone'** were among the best even at Keldnaholt, while the control variety **'Cezanne'** was unsurpassed at Apelsvoll.

Within **LP**, **'Chardin'** (DP17-2147) was somewhat more promising than the other varieties at both Landvik and Apelsvoll.

Within **PT**, there were small differences between **'Qasar'** and **'Racehorse'** in climate zone 2, but **'Qasar'** had higher overall score than **'Racehorse'** in climate zone 1.

The last and third green years (2010) will tell us more about the varieties.

## 2. Introduction

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Plant breeding is a long-term and continuous process where new varieties are released every year. Therefore, evaluation of new turfgrass varieties for golf greens must also be a continuous process. Variety trials on USGA greens are expensive and the seed consumption small compared to other markets. The seed industry has signalled that variety testing for greens must, at least for the most part, be funded by the golf sector itself.

On this background, we thank The Scandinavian Turfgrass and Environment Research Foundation (STERF) for a financial grant, and a number of breeding- and seed companies for submitting varieties and paying entrance fees, to fund a variety testing project on Scandinavian golf greens for the period 2007-2010.

The objectives of the project are:

- To clarify which varieties of *Agrostis*, *Festuca*, *Poa* and *Lolium* are best suited for golf greens at four experimental sites representing the two major climate zones in the Nordic countries
- To create meeting places for discussions between plant breeders, seed companies and greenkeepers in order to encourage cultivar awareness and continued efforts into turfgrass breeding for northern environments

Preliminary results from the sowing year and the first green year of the project have been presented in previous reports to STERF in December 2007 (Molteberg et al. 2007) and 2008 (Molteberg et al. 2008), and at conferences, meetings, seminars and field days etc. in Norway, Sweden and Denmark in 2007-2009. The present report gives an update for the sowing year (2007) and the two first green years 2008 and 2009.

## 3. Methods

### 3.1 Plant material

A total of 42 varieties, including controls, were entered into the project. The distribution between species was as follows:

- Velvet bentgrass (*Agrostis canina*): 3 varieties
- Creeping bentgrass (*Agrostis stolonifera*): 10 varieties
- Colonial bentgrass (*Agrostis capillaris*): 5 varieties
- Slender creeping red fescue (*Festuca rubra* var. *trichophylla*): 6 varieties
- Chewings fescue (*Festuca rubra* var. *commutata*): 11 varieties
- Perennial ryegrass (*Lolium perenne*): 5 varieties
- Rough-stalked meadow grass (*Poa trivialis*): 2 varieties

Table 1 gives a complete list of varieties included in the project.

Table 1. List of varieties included in green trials in Scandinavia 2007-2010.

Variety	Breeder / Representative	Variety	Breeder / Representative
<b><i>Festuca rubra</i> var. <i>commutata</i></b>		<b><i>Agrostis stolonifera</i></b>	
Center (C)	Innoseeds	Independence(C)	Innoseeds
Margret	DLF-Trifolium	Norwegian type	(prev. called Nordlys) Graminor
Greensleeves	DLF-Trifolium	Runner (IS AP 14)	DLF-Trifolium
Charme (Frc 04210)	Euro Grass	CY-2	DLF-Trifolium
Excellence	Euro Grass	Sandhill	Weibull Trädgård/Pickseed
LøRc 0215	Graminor	Bengal	Barenbrug
LøRc 0021 (Linda)	Graminor	Alpha	RAGT Genetique
SW RSC6101	Svalöf Weibull	Declaration	RAGT Genetique
SW RSC6028	Svalöf Weibull	L93	RAGT Genetique
Barswing	Barenbrug	MacKenzie	Scandinavian Seed/Pickseed
Musica	RAGT Genetique		
<b><i>Festuca rubra</i> var. <i>trichophylla</i></b>		<b><i>Agrostis capillaris</i></b>	
Cezanne (C)	Innoseeds	Jorvik (C)	DLF-Trifolium
Amarone	DLF-Trifolium	Leirin (C)	Graminor
Corrida	DLF-Trifolium	Greenspeed (TAT 720)	DLF-Trifolium
Niola	Euro Grass	LøEk 0015	Graminor
Finesto (Frt 04213)	Euro Grass	AberRoyal	Scandinavian Seed/BSH
Viktorka	Barenbrug		
<b><i>Poa trivialis</i></b>		<b><i>Agrostis canina</i></b>	
Qasar	Weibull Trädgård/Pickseed	Villa (C)	Innoseeds
Racehorse	Scandinav. Seed/Pickseed	Legendary	DLF-Trifolium
		Vesper	Scandinavian Seed/Pickseed
<b><i>Lolium perenne</i></b>			
Mascot (INLP 634)	DLF-Trifolium		
Chardin (DP 17-2147)	DLF-Trifolium		
Madrid	DLF-Trifolium		
DP 17-9974	DLF-Trifolium		
Ligala	Euro Grass		

C = Control variety (reference)

Among the creeping bentgrasses there is a variety listed as ‘**Norwegian type**’. At the start in this project this variety was called ‘**Nordlys**’. The owner and breeder of this variety, Graminor, has now confirmed that the seed submitted to this project was a mixture of colonial bentgrass and creeping bentgrass, with most of the seed being of the colonial type. Despite this, the variety will be presented together with creeping bentgrass in this report.

### 3.2 Experimental sites and general climatic conditions

Trials were established at the experimental locations Östra Ljungby Naturgymnasium, Sweden, Bioforsk Landvik and Bioforsk Apelsvoll, Norway, and Keldnaholt Golf Course, Iceland.

	Northern latitude	Altitude	Mean monthly temperature June-August	Mean monthly temperature December-February	Annual precipitation
Östra Ljungby <sup>1</sup>	56°11'N	38 m a.s.l	16.3°C	0.3°C	594 mm
Landvik	58°20'N	6 m a.s.l	15.4°C	-1,1°C	1230 mm
Apelsvoll	61°42'N	250 m a.s.l	14.0°C	-7.2°C	600 mm
Keldnaholt	64°09'N	30 m a.s.l.	10.5°C	-0.5°C	950 mm

<sup>1</sup> Data for Alnarp

The four locations can roughly be said to represent the two main climatic zones in Scandinavia (Fig 1). Östra Ljungby and Landvik represent climate zone 1, which includes Denmark, Skåne (the southernmost part of Sweden) and the coastal regions of southern Sweden and Norway. In addition, Östra Ljungby represents the growing conditions for golf courses in the densely populated regions of eastern Denmark and Skåne. Apelsvoll and Keldnaholt represent climate zone 2, which includes Iceland, Finland, central and northern parts of Sweden and Norway, plus continental areas in southern Sweden and Norway. Keldnaholt has a climate representing not only to Iceland, but also coastal areas in central and northern Norway. Apelsvoll usually has snow cover for more than five months and sometimes ice cover for more than three months. This is in contrast to Landvik and Östra Ljungby, which usually have snow cover more sporadically during wintertime.

Unfortunately, the trial at Östra Ljungby had to be closed in spring 2009 because of moving of the activity of the naturgymnasium to another city (Ljungbyhed). For this reason, results from Östra Ljungby will not be presented in this report.

More about the winter conditions during this project will be given in later chapters.



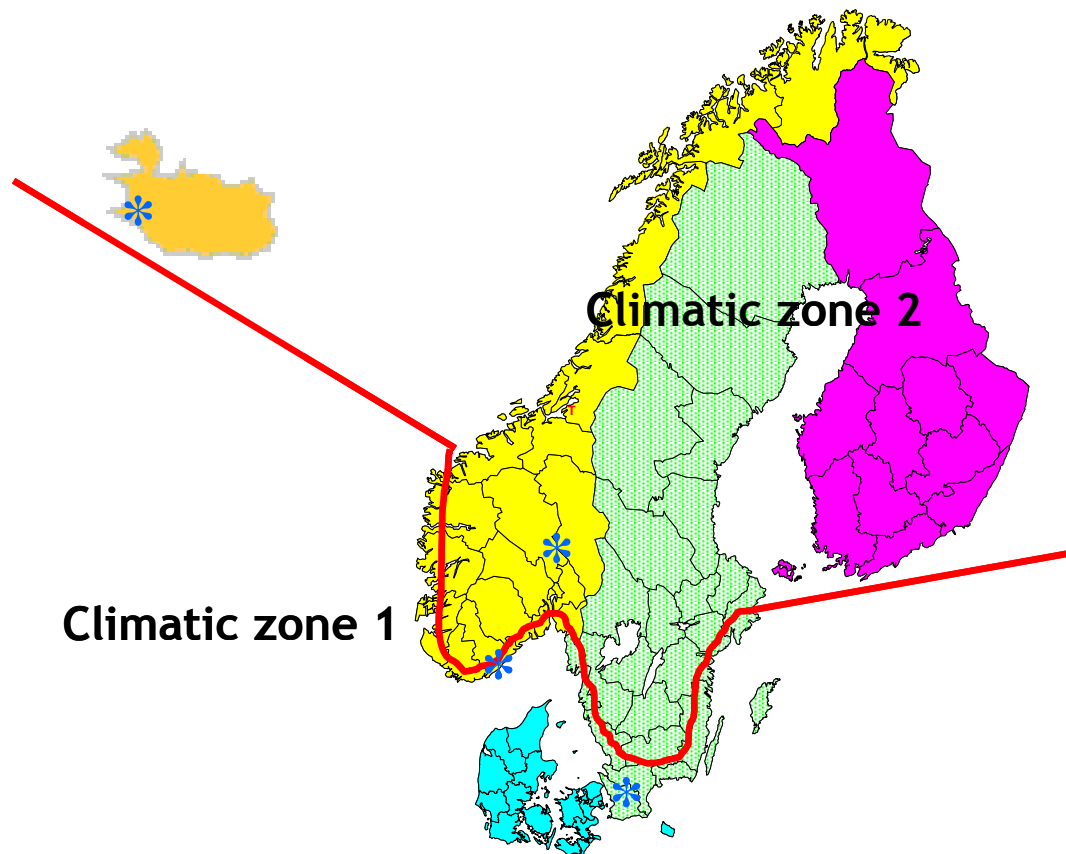


Fig. 1. Division of Scandinavia in two climate zones. The trial sites are indicated with blue stars.

### 3.3 Green construction, experimental design and grow-in 2007

Detailed descriptions of green construction, experimental design and turfgrass establishment in 2007 were presented by Molteberg et al. (2007). Some of the major points from the sowing year were as follows:

- Seeding dates in 2007 were 26 June, at Apelsvoll, 11 July at Landvik, 17 August at Keldnaholt and 6 September at Östra Ljungby
- The trials at Apelsvoll and Landvik had a good establishment and the average percentage of plant cover in autumn of 2007 was more than 90 %.
- The trial at Keldnaholt was not seeded until August due to delayed construction of the green. The time for grasses to establish was short, but percent plant cover in the autumn was more than 80 % for most varieties. However, because of poor root systems, this trial faced great risks for damages from freezing, wind erosion, and water erosion during winter.

### 3.4 Winter conditions 2007-08

Detailed descriptions of the winter conditions 2007-2008 (before the first green year) were presented by Molteberg et al. (2008). In short, the winter discriminated strongly among species and varieties at Apelsvoll and Keldnaholt. At Landvik there was an outbreak of *Microdochium nivale* after a late snowfall in March, but all plots recovered quickly without any reseeding.

### 3.5 Winter conditions 2008-09

**Apelsvoll:** The first snow covered the green in late October, but by the middle of November the green was without snow and ground frost. By the end of November the green was again covered with snow, but now also with frost in the ground. From January through March the green got more snow and a two to three cm layer of ice built up. On 14 April the green still had 20 cm of snow and a hard ice cover. The green was without snow around 20 April, but during the last weeks until snowmelt there was plenty of wet snow and water while still frost in the ground. This means that the experimental green had a continuous layer of snow and ice for at least 4.5 months and these winter conditions caused a lot of winter damage. In previous years the worst damages used to be observed in creeping bent, perennial ryegrass and rough-stalked meadow grasses, but this year the whole green with all species including red fescue and colonial bentgrass were damaged and mostly dead (Photo 1). The severe damage can probably be explained by drowning and absence of air during the melting period. Just a few plants survived and there were no statistical differences among species or varieties when rating the plots in spring. For that reason the whole green was sprayed with glyphosat (Roundup) on 8 May, verticut, reseeded and top-dressed on 19 May (Photos 2 and 3).

**Landvik:** As usual on the Norwegian south coast, the winter implied occasional snow falls and frequent fluctuations between frost and thaw periods. During the winter 2008-09, the longest continuous period with snow was from 20 January to 12 March. Green-up started in early April and the winter damage was small (Photo 4). Just some varieties, mainly of creeping bent and colonial bentgrass, were winter damaged.

**Keldnaholt:** Although the winter was more normal than the previous one, some winter damages were observed in spring 2009. However, due to more than enough rain in spring, the plots recovered and the experiment was looking good later in the summer (Photo 5).

### 3.6 Mowing, fertilization and regular maintenance 2008

#### **Landvik and Apelsvoll:**

The experiment at Landvik (photo 6) was mowed three times per week to a height of 5 mm for perennial ryegrass, red fescue and rough-stalked meadow grass and 3 mm for the bentgrasses. Gradually higher mowing heights (up to 5 mm in bentgrasses and 7 mm in the others) were practiced in the beginning and end of the growing season. The mowing was carried out with "John Deere" walk-behind mowers and clippings collected.

Because of the reseeding in the spring, mowing at Apelsvoll did not start until 8 June. Mowing height was set to 8 mm in fescues, perennial ryegrass and rough-stalked meadowgrass, and 6 mm in the bentgrasses. Later in the season, the trial was also here mown three times a week and mowing height gradually reduced to 5 and 4 mm in fescues and bents, respectively. At the last mowings in late September higher mowing heights were again practised.

Both trials received inorganic granular fertilizer, partly Andersson 13-2-13, partly straight ammoniumsulfate and partly Yara's 'Arena' program) at biweekly intervals, at Landvik totaling 0.7 kg N/100 m<sup>2</sup> for perennial ryegrass, red fescue, colonial bentgrass and velvet bentgrass and 1.4 kg N/100 m<sup>2</sup> for creeping bentgrass and rough-stalked meadow grass and at Apelsvoll totaling 0.9 and 1.8 for the two groups, respectively. The inclusion of ammoniumsulfate, either straight or in the form of Andersson 13-2-13, was accomplished to prevent take-all patch (*Gaeumannomyces graminis*) due to the high pH in the compost-based growth medium (Green Mix).

The green at Landvik had been aerated with 12 mm hollow tines and the cores raked off the field on 19 November 2008. On 26 March 2009 the green was dressed heavily (3 l / m<sup>2</sup>) and the sand brushed into the holes. During the rest of the season, the green was aerated twice with solid spikes (5 May and 24 Sep) and dusted with 0.2-0.3 mm washed Baskarp sand (grain size 0.2-0.8 mm) for a total of 16 times. Verticutting was performed four times but only in the bentgrasses and rough-stalked meadowgrass.

At Apelsvoll the green (al species) was verticut once and topdressed twice after the initial reseeding and heavy dressing in May. As the last operation before winter, the green was aerated with 12 mm solid tines in October (Photo 7).

The green was subjected to artificial wear three times per week corresponding to 20.000 rounds of golf per year at Landvik, but not at Apelsvoll, because of the reseeding in spring.

#### **Keldnaholt:**

As mentioned in the report from 2008 this trial was maintained mostly like a fairway or lawn in the first green year. In 2009, the mowing height started at 12 mm in early spring but it was lowered to 5.5 mm by the middle of August, the same height for all species (Photo 8).

The experiment was verticut twice and dressed three times in 2009. It was fertilized six times using inorganic fertilizer of different types from Scotts and Angus. The total amounts were 0.9 kg N/100 m<sup>2</sup> for red fescue and 1.8 kg N/100 m<sup>2</sup> for the others species.

#### **For all sites:**

No pesticides or growth regulators were used in the trials. All trials were irrigated after fertilization, topdressing and otherwise at 10-15 mm soil water deficit.

### **3.7 Registrations, statistical calculations, and presentation of results**

The trials at Apelsvoll, Keldnaholt and Landvik were rated at monthly intervals for visual merit (overall turfgrass quality) and most other characters.

The characters presented in tables 2-9 in chapter 7 Appendix, were defined as follows:

- **Visual merit:** Overall turf quality (1-9, 9 is best quality). At Landvik, the overall mean has been weighed with 1/5 on the sowing year, 2/5 on the first green year and 2/5 on the second green year. Spring, summer and autumn values are means of all ratings only in the first and second green year during the periods 15 March-10 June, 11 June-10 September and 11 September -15 November, respectively. Due to reseeding at Apelsvoll, the mean has been weighed with 1/5 on the sowing year 2007, 1/5 on the reseeding year 2009 and 3/5 on the first green year 2008. Due to few registration in the sowing year and lenient maintenance in the two first years of at Keldnaholt, the mean for this location has been weighed with, 1/3 on the first green year and 2/3 on the second green year.
- **Tiller density** (1-9, 9 is highest density): Values have been weighed between years in the same way as visual merit.
- **Plant cover:** Per cent of plot area covered with healthy turf of the sown species. Values for Landvik and Apelsvoll have been weighed in the same way as visual merit, but for Keldnaholt, the mean also has been weighed with 1/5 on the sowing year, 1/5 on the first green year and 3/5 on the second green year, as at Apelsvoll.
- **Date for green-up in spring** (=earliness): Recorded as day no after 28 February at Apelsvoll, Keldnaholt and Landvik. Not recorded at Apelsvoll in 2009.
- **Winter damage** (Per cent of plot area): Values include both biotic and abiotic winter damages and are means of measurements in the spring of the first and second green year. At Apelsvoll only means of measurements in the first green year.
- **In-season disease** (Per cent of plot area): In-season diseases mostly occurred during warm and rainy periods in late summer and autumn. Major pathogens were *Pythium*, *Fusarium*, *Microdochium nivale*, *Laetisaria fuciformis* (red tread) and *Colletotrichum graminicola* (anthracnose). Values have been weighed in the same way as visual merit.
- **Colour** (1-9, 9 is darkest green): Mean values of the first and second green year at the all sites (not determined in the sowing year).

- **Dormancy colour** (1-9, 1 is very pale or brown and 9 is most intensely green): Intensity of green colour outside the growing season. Mean of registration before green-up and after growth cessation in late autumn of the first and second green year at the all sites.
- **Leaf fineness** (=texture) (1-9, 9 is finest leaves): Mean values of assessments in July and September of the first and second green year. (Not assessed in the sowing year and not in *Festuca* at Keldnaholt).
- **Height increment**: Calculated from height measurements with a prism device on one Monday per month. The green had been left uncut since Friday. Mean values of the first and second green year. (Not assessed at Keldnaholt and only in 2009 at Apelsvoll).

The experimental data were analyzed using the Minitab 15 procedure Proc Anova, GLM. Analyses of variance were accomplished separately for each species and with block number and sites as the random variables. Whenever significant differences occurred, least significant differences (LSD) at the 5% probability level were calculated for direct comparisons between varieties. In a few cases, *P*-values between 5% and 15% have been reported as 'tendencies'. The results are presented in Tables 2-9. In these tables, species or varieties have been ranked for visual merit overall mean scores. In cases where two or more varieties had the same scores, they have further been ranked for tiller density, and, if necessary, for winter damage.

## 4. Results and discussion

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Due to the high mowing in the sowing year, first green year and first half of second green year at Keldnaholt, and to the total winter killed and reseeding in the second green year at Apelsvoll, most emphasis will be placed on the trial at Landvik for characters such as tiller density, colour, leaf fineness and height increment.

### 4.1 Comparison of species (Table 2)

As shown in Table 2, the interaction among species and experimental sites was significant for all characters recorded in the project. At Apelsvoll (climate zone 2), all varieties of perennial ryegrass and rough-stalked meadow grass were completely dead and most varieties of creeping and colonial bentgrass severely injured after the first winter. Velvet bentgrass was significantly more winter tolerant than the other bentgrasses, but it was not as tolerant as red fescue, especially of the subspecies *commutata*. The results from Keldnaholt confirmed better winter tolerance in *Festuca* sp. than in *Agrostis* sp., but the winter survival of perennial ryegrass and rough-stalked meadow grass was much better than at Apelsvoll. To some extent, this can be explained by the 'fairway' mowing height at Keldnaholt.

At Landvik (climate zone 1) the worst winter damages, mainly of pink snow mould, after the first green year were observed in creeping and velvet bentgrass. Rough-stalked meadow grass was almost as resistant to pink snow mould as was red fescue. On average for varieties, colonial bentgrass appeared to be more susceptible to pink snow mould than was perennial ryegrass.

Looking at visual merit scores, perennial ryegrass was ranked on the top together with the fescues and rough-stalked meadow grass at Keldnaholt (climate zone 2). At least for perennial ryegrass, the high score clearly reflects the mowing height which was not representative for greens in general. At Apelsvoll, the ranking of species for visual merit scores mostly reflected winter tolerance, with both subspecies of red fescue and velvet bentgrass on the top of the list. At Landvik, where the snow mold injury was not lethal, visual merit scores were not significantly different among velvet bentgrass, creeping bentgrass, slender creeping red fescue and chewings fescue, but all of these species were significantly better than colonial bentgrass, rough-stalked meadow grass and perennial ryegrass.

As expected, especially velvet bentgrass but also perennial ryegrass had high scores for dormancy colour. Slender creeping red fescue was lighter green during the growing season and maintained better colour during the winter than chewings fescue (Photo 4). At Landvik, rough-stalked meadow grass had the lowest score for dormancy colour after growth cessation in late autumn, but it had a nice green colour in early spring (Photo 4). At Keldnaholt, rough-stalked meadow grass had the highest score for dormancy colour, again perhaps because of the mowing height.

At both Apelsvoll and Landvik, colonial bentgrass was mostly infected by "in season diseases", mainly *Pythium* and *Microdochium nivale*. At Apelsvoll and Keldnaholt, velvet bentgrass was also susceptible to these diseases.

On average for sites, velvet bentgrass had the lowest height growth, followed by creeping bentgrass and colonial bentgrass. Velvet bentgrass was also in a class of its own with respect to tiller density. Perennial ryegrass had, as expected, the most vigorous height growth and was not as dense as the other species. But this was not recorded at Keldnaholt, probably because the high mowing height. Together with rough-stalked meadow grass, perennial ryegrass is a "new" species for golf greens in Scandinavia, and probably also in the rest of Europe. So far, this species seems to have too poor winter survival and form too open turfs to be recommended for greens.

## 4.2 Colonial bentgrass varieties (Table 3)

There were no significant differences in overall scores among the colonial bentgrass varieties in climate zone 1 (Landvik), but **'Greenspeed'** (TAT 720) and **'Aberroyal'** were significantly better than the Norwegian varieties **'LøEk 0015'** and **'Leirin'** in the second green year. The differences were mostly due to higher density and better colour retention for **'Greenspeed'** and **'Aberroyal'** during the dormancy period, and to lower scores for the Norwegian varieties in autumn (Photo 9). While the Norwegian varieties were less infected by snow mould during the first winter, green-up in spring was generally faster in **'Greenspeed'** and **'AberRoyal'**. The control variety **'Jorvik'** suffered from *Pythium* in the sowing year and was otherwise ranked between the two other groups at Landvik.

In climate zone 2 (Apelsvoll and partly at Keldnaholt) **'Leirin'** and **'LøEk 0015'** had the highest visual merit scores because of better winter survival. **'LøEk 0015'** may be an interesting variety for climate zone 2 as it represents an improvement in leaf fineness and - to a lesser extent - tiller density - compared with **'Leirin'**. **'AberRoyal'** and **'Greenspeed'** were the least winter-hardy varieties in climate zone 2. **'Jorvik'** was the variety with the highest density at Apelsvoll.

## 4.3 Velvet bentgrass varieties (Table 4)

In climate zone 1 (Landvik), differences among the three varieties of velvet bentgrass were not significant except for green-up date, colour and dormancy colour. **'Vesper'** was darker (Photo 10) and maintained greener colour during the dormancy period than **'Legendary'** and **'Villa'**. This was also the tendency in climate zone 2 (Apelsvoll).

In climate zone 2 (Apelsvoll) **'Villa'** had significantly higher visual merit scores than **'Vesper'** and **'Legendary'** because of better winter survival, more complete plant cover and less "in season diseases" such as *Pythium*. At Keldnaholt **'Villa'** also had less "in season diseases". On the other hand, **'Villa'** had the lowest overall visual merit score at Keldnaholt, but differences from the two other varieties were not significant.

## 4.4 Creeping bentgrass varieties (Table 5)

Within creeping bentgrass in climate zone 1 (Landvik), the reference variety **'Independence'** (Photo 11), which was the best one in the last variety testing period 2003-2006 (Aamlid et al. 2006), was only surpassed by **'Declaration'** and **'Runner'** ('IS AP 14'). Although differences for overall visual merit were not significant, these three varieties were also in a class of their own with respect to tiller density. Among the three varieties, **'Independence'** had the darkest colour, while **'Declaration'** the finest leaves, best dormancy colour and was least susceptible to snow mould. The **'Norwegian type'** had wider leaves, more height growth and was not as dense as the other varieties at Landvik.

At Apelsvoll, **'Norwegian type'** was in a class of its own with respect to winter survival and visual merit scores. Most other varieties were almost dead after two winters. However, all creeping bentgrass varieties were reseeded every year and recovered well, and in the autumn there were differences in visual merits between the varieties. **'CY-2'**, **'Sandhill'**, and **'Mackenzie'** all appeared to be better than the control variety **'Independence'**. **'Declaration'** was clearly inferior, unlike the situation at Landvik.

At Keldnaholt (climate zone 2) only **'CY-2'** was about on the same level as **'Independence'**. **'Norwegian type'** was not nearly as tolerant to the prevailing winter conditions (wind, little or no snow, dessication) at Iceland as it was to the ice and snow conditions at Apelsvoll.

## 4.5 Chewings fescue varieties (Table 6)

On average for three years, **'Musica'** (Photo 12) had higher visual merit and density scores than any other variety at Landvik. However, **'Barswing'**, **'Greensleeves'** and **'Margret'** also stood out better than the control variety **'Center'** and were dense and had high scores in this zone. Among these varieties, **'Musica'** and **'Greensleeves'** were ranked significantly before the others for dormancy colour and greened up one day earlier than the others. Significantly behind the other varieties in density, and with a clear tendency for lower visual merit scores, were **'LøRc 0015'** and **'SW RSC6101'**.

There were no significant differences in overall visual merit scores among chewings fescues at either Apelsvoll or Keldnaholt. Nonetheless, the qualities of **'Musica'** and **'Barswing'** at low mowing height were confirmed by the visual merit ratings from the second green year and tiller density at Apelsvoll. Rather unexpectedly **'LøRc 0021'** (Linda) was at the bottom of the list at Apelsvoll. One explanation of the bad score for this variety can be that the seed lot submitted from the breeding company in 2007 and 2009 was contaminated with weeds. **'LøRc 0215'** and **'SW RSC 6101'**, the two varieties from the bottom of the list at Landvik, both obtained high scores at Keldnaholt. This might be due to the mowing height practiced in this field.

Differences in winter damage among chewings fescues were not significant at either Apelsvoll or Keldnaholt. Nevertheless it seems that the control variety **'Center'** was more injured than the other chewings fescues. This also explains its relatively low scores for visual merit and plant cover at Apelsvoll. Mainly because of better winter hardiness, the Swedish breeding line **'SW RSC 6028'** also seems to have merit in climate zone 2.

**'Excellence'** distinguished itself as a dark variety at both Landvik and Keldnaholt

In both climate zones (Landvik and Apelsvoll) there were only minor observations of "in season diseases" in chewings fescue.

## 4.6 Slender creeping red fescue varieties (Table 7)

In climate zone 1 (Landvik) there were significant differences in visual merit, tiller density and leaf fineness between the three varieties at the top (**'Finesto'** (Frt 04213, Photo 13), **'Viktorka'** and **'Amarone'**) and the three at the bottom (**'Cezanne'**, **'Niola'**, and **'Corrida'**) of the ranking list. The reference variety **'Cezanne'**, which highly ranked in the previous testing period 2003-2006 (Aamlid et al. 2006) had low scores for plant cover which may be explained by poor establishment in the sowing year. **'Finesto'** and **'Viktorka'** had better dormancy colour than the other varieties.

In climate zone 2, there were no significant differences in visual merit among slender creeping red fescues, but the control variety **'Cezanne'** was ranked highest at Apelsvoll close followed by **'Niola'** and **'Finesto'**. Part of the reason for this may be less winter damage, although this difference was not significant. At Keldnaholt **'Viktorka'** and **'Amarone'** were at the top of the list as in climate zone 1.

Even for this subspecies of red fescue there were only minor observations of "in season diseases" at all sites.

## 4.7 Perennial ryegrass varieties (Table 8)

Within perennial ryegrass **'Chardin'** (DP17-2147) was ranked significantly before the other varieties in climate zone 1 (Photo 14). The variety was significantly denser and had earlier green-up than the other ryegrasses. At the bottom of the list, **'Mascot'** (INLP 634) had the lowest visual merit score. **'Madrid'** had significantly more winter damage (pink snow mould) than **'Chardin'**, **'Ligala'**, **'DP17-9974'** and **'Mascot'**.

In climate zone 2 (Apelsvoll), all varieties of perennial ryegrass were all dead both after the first and after the second winter. The ryegrass plots were reseeded every year in May and recovered well, and in the autumn there were differences in visual merit scores among the varieties. The plant cover was around 95-100 percent (not shown in the table). Like in the sowing year and in climate zone 1 (Landvik), **'Chardin'** made the best impression. Also at Keldnaholt (in climate zone 2), **'Chardin'** was among the best varieties together with **'Madrid'**.

On average for sites, **'Madrid'** and **'DP17-9974'** had the darkest colour. Just traces of "in season diseases" were observed in perennial ryegrass.

#### **4.8 Rough-stalked meadow grass varieties (Table 9)**

Although **'Qasar'** was ranked significantly before **'Racehorse'** at Landvik, differences between the two varieties of rough-stalked meadow grass were generally small in both climate zones.



## 5. Conclusions

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Especially the first winter in the project discriminated strongly among species and varieties. **On average for varieties within species**, the results shows that chewings fescue (FRC) and slender creeping red fescue (FRT) had significantly better winter survival than colonial (ACAP), velvet (ACAN) and creeping bentgrass (AS), perennial ryegrass (LP) and rough-stalked meadow grass (PT) in both zones. In zone 2 the fescues were at the top for overall turfgrass quality, only accompanied by velvet bentgrass (ACAN) at Apelsvoll and perennial ryegrass (LP) and rough-stalked meadow grass (PT) at Keldnaholt. The ranking for overall quality in zone 1 was ACAN >FRC>AS>FRT>ACAP>PT>LP.

Different varieties of **colonial bentgrass** (ACAP) have to be used in zones 1 and 2. **'AberRoyal'** and **'Greenspeed'** had higher scores than the control variety **'Jorvik'** in zone 1, while the control variety **'Leirin'** was unsurpassed in zone 2.

The control variety **'Villa'** of **velvet bentgrass** (ACAN) had better winter survival and overall score than **'Vesper'** and **'Legendary'** at Apelsvoll. Differences among these varieties were small at Landvik and Keldnaholt.

Within **creeping bentgrass** (AS), **'Declaration'** and **'Runner'** ('IS AP 14'), appeared to be good alternatives to the control variety **'Independence'** in zone 1. **'CY-2'** performed well in zone 2, though it was clearly inferior to **'Norwegian type'** (previously called 'Nordlys'; really a mix of AS and ACAP) as to winter survival at Apelsvoll.

**'Musica'** had higher overall scores than any other **chewings fescues** (FRC) in zone 1 and at Apelsvoll in zone 2. Other FRC better than the control variety **'Center'** in zone 1 were **'Barswing'**, **'Greensleeves'** and **'Margret'**. **'LøRc0215'** had the highest score at Keldnaholt.

Within **slender creeping red fescue** (FRT), **'Finesto'** (Frt 04213), **'Viktorka'** and **'Amarone'**, had high scores in zone 1. **'Viktorka'** and **'Amarone'** were among the best even at Keldnaholt, while the control variety **'Cezanne'** was unsurpassed at Apelsvoll.

Within **perennial ryegrass** (LP), **'Chardin'** (DP17-2147) was somewhat more promising than the other varieties at both Landvik and Apelsvoll.

Within **rough-stalked meadow grass**, (PT), there were small differences between **'Qasar'** and **'Racehorse'** in climate zone 2, but **'Qasar'** had higher overall score in climate zone 1.

The last and third green years (2010) will tell us more about the varieties.

## 6. References

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## 7. Appendix (photos and tables)

Table 2: Comparison on species

Species	Overall mean	Sowing Year	Visual merit (1-9)				Autumn	Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
			Green Year 1	Green Year 2	Spring	Summer										
<b>A) Mean of sites</b>																
<i>F. rubra com.</i>	5.6	4.6	6.1	5.4	4.8	6.0	5.5	95	55	10	1	5.1	3.7	7.7	1.1	
<i>F. rubra trich.</i>	5.3	3.7	5.6	5.5	4.4	5.8	5.7	92	55	17	1	4.8	4.5	7.7	1.0	
<i>A. canina</i>	5.0	5.4	3.4	6.1	4.2	5.3	6.2	86	59	42	9	4.9	6.1	6.1	0.4	
<i>A. stolonifera</i>	4.7	4.8	3.1	5.9	3.9	4.7	5.9	84	56	54	6	4.9	4.7	4.7	0.6	
<i>Poa trivialis</i>	4.6	5.6	4.2	4.8	3.5	4.5	5.0	83	57	49	1	5.4	4.1	4.5	1.0	
<i>Lolium perenne</i>	4.2	4.1	4.7	4.0	3.1	4.5	4.1	85	57	45	1	5.1	5.0	3.9	1.4	
<i>A. capillaris</i>	4.0	4.2	2.8	4.9	3.8	4.0	4.8	81	61	48	7	5.1	4.2	4.7	0.8	
P % species	ns	ns	ns	ns (6)	ns	ns	1.1	ns	2	ns	3.6	ns (10)	ns	1	0.0	0.2
LSD 5%							0.6		4		12			0.6	0.4	0.2
P % species x sites	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of sites	3	2	3	3	3	3	3	3	3	2	3	3	3	3	2	2
<b>B) Apelsvoll</b>																
<i>F. rubra com.</i>	4.9	4.3	5.0	5.1	4.3	5.1	5.3	95	58	13	0	4.8	3.9	7.5	0.9	
<i>A. canina</i>	4.8	5.7	4.3	5.5	3.3	4.9	5.3	7.2	89	64	43	14	4.8	5.5	5.8	0.4
<i>F. rubra trich.</i>	4.4	3.9	4.4	4.6	3.4	4.6	4.8	4.5	92	58	26	0	4.8	4.3	7.5	0.7
<i>A. stolonifera</i>	4.2	5.6	3.3	5.4	1.6	4.3	5.4	4.7	80	84	9	4.8	4.5	4.1	0.4	
<i>A. capillaris</i>	3.8	4.6	3.3	4.7	2.3	4.1	4.4	5.0	80	66	69	16	5.2	3.9	4.4	0.5
<i>Poa trivialis</i>	3.6	4.9	2.5	5.6	1.0	4.0	5.0	2.9	78	100	0	4.6	4.0	3.8	0.9	
<i>Lolium perenne</i>	2.7	3.4	2.0	4.2	1.0	3.3	3.2	2.1	75	100	2	4.7	5.1	2.9	1.1	
P % species	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LSD 5%	0.7	0.7	1.1	1.1	1.4	0.8	0.8	0.5	8	2	33	4	0.3	0.8	0.2	0.3

Table 2 continued: Comparison on species

	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>C) Keldnaholt</b>																
<i>F. rubra com.</i>	6.7		7.5	6.2	4.4	7.1	7.0	6.6	93	84	17	3	4.9	4.8		
<i>F. rubra trich.</i>	6.6		7.0	6.3	4.9	6.8	7.3	6.7	90	86	23	2	4.4	5.0		
<i>Lolium perenne</i>	6.5		8.3	5.6	4.9	6.9	6.5	6.5	88	90	28	0	4.8	5.9	4.7	
<i>Poa trivialis</i>	6.4		6.0	6.6	5.5	6.3	8.0	6.4	92	87	45	0	6.0	6.4	4.3	
<i>A. canina</i>	4.9		1.0	6.8	5.4	4.0	7.8	5.5	79	87	59	8	3.9	6.4	4.7	
<i>A. stolonifera</i>	4.6		1.0	6.4	5.2	3.8	7.4	5.1	79	89	56	6	3.8	5.8	4.9	
<i>A. capillaris</i>	4.1		1.0	5.7	5.3	3.3	6.3	4.8	71	89	65	0	4.3	5.9	5.1	
P % species	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
LSD 5%	0.6		1.1	0.8	1.2	0.7	1.2	0.5	7	2	8	4	0.3	1.1	0.4	

**D) Landvik**

<i>A. canina</i>	5.5	5.1	5.0	6.1	3.8	7.1	5.4	7.2	91	25	22	3	5.9	6.3	7.8	0.5
<i>F. rubra com.</i>	5.2	5.0	5.6	4.8	5.6	5.6	4.4	5.3	98	24	1	0	5.6	2.4	7.9	1.4
<i>A. stolonifera</i>	5.1	4.0	5.0	5.8	4.9	6.1	5.0	6.1	93	24	21	2	6.1	3.9	4.9	0.9
<i>F. rubra trich.</i>	5.0	3.6	5.4	5.4	4.9	6.0	5.1	5.5	96	23	1	0	5.2	4.2	7.8	1.2
<i>A. capillaris</i>	4.1	3.8	4.0	4.3	4.0	4.6	3.8	5.2	92	27	11	6	5.9	2.9	4.5	1.0
<i>Poa trivialis</i>	3.8	6.3	4.1	2.2	4.0	3.3	2.1	4.5	79	27	2	3	5.7	2.0	5.6	1.1
<i>Lolium perenne</i>	3.4	4.8	3.9	2.3	3.4	3.3	2.6	3.5	91	25	5	2	5.6	4.0	4.1	1.7
P % species	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LSD 5%	1.0	0.9	1.0	1.3	0.9	1.3	1.3	0.9	4	2	10	3	0.8	1.3	0.8	0.2

**Table 3: Varieties of colonial bentgrass (*Agrostis capillaris*)**

Varieties	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>A) Mean of sites</b>																
Leirin (C)	4.2	4.2	3.1	4.6	4.7	4.0	4.5	4.9	86	59	32	7	4.9	2.8	4.0	0.9
LøEk 0015	4.1	4.0	3.1	4.6	4.3	4.0	4.7	4.9	85	60	39	6	5.5	3.4	4.7	0.7
Jorvik (C)	4.0	4.2	2.6	5.0	3.5	4.0	4.9	5.4	80	61	49	8	5.3	4.8	4.9	0.8
Greenspeed (TAT 720)	4.0	4.4	2.5	5.3	3.3	4.2	5.0	4.9	77	61	61	8	4.8	5.2	4.9	0.7
AberRoyal	3.9	4.3	2.5	4.9	3.5	3.9	4.9	5.0	78	61	60	6	5.1	5.0	4.8	0.8
P % varieties	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns (12)	ns	ns(15)	0.1	0.7	ns
LSD 5%														0.3	0.4	
P % varieties x sites	0.1	ns	0.0	0.6	0.3	0.4	0.0	0.0	0.2	0.0	0.2	3	0.0	0.0	ns	2
Number of sites	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	2
<b>B) Apelsvoll</b>																
Leirin (C)	4.4	4.7	4.2	4.4	3.8	4.3	4.5	5.2	89	64	32	18	5.1	2.8	4.0	0.5
LøEk 0015	4.4	4.2	4.4	4.6	3.7	4.6	4.5	5.1	90	64	50	11	5.4	3.5	4.4	0.4
Jorvik (C)	3.9	5.0	3.2	5.0	2.0	4.1	4.8	5.5	80	66	69	14	5.3	4.3	4.5	0.6
Greenspeed (TAT 720)	3.5	4.6	2.4	5.6	1.0	4.1	4.5	4.5	72	69	98	20	4.8	4.5	4.5	0.5
AberRoyal	3.0	4.5	2.2	4.1	1.0	3.1	3.8	4.5	70	69	93	15	5.2	4.3	4.5	0.6
P % varieties	0.3	ns (6)	0.1	ns (15)	0.0	ns (7)	ns (5)	2.2	0.0	ns	1.1	ns	ns (7)	0.1	ns	ns
LSD 5%	0.6		0.8		1.0			0.6	7		35			0.6		

Table 3 continued: Varieties of colonial bentgrass (*Agrostis capillaris*)

	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>C) Keldnaholt</b>																
Leirin (C)	4.4		1.0	6.2	6.0	3.6	6.3	5.0	76	87	59	1	4.2	4.0	4.5	
Jorvik (C)	4.2		1.0	5.8	5.0	3.4	6.3	5.0	72	90	63	1	4.4	6.8	5.3	
LøEk 0015	4.2		1.0	5.8	5.0	3.3	6.7	4.9	73	87	63	0	4.3	5.2	5.2	
AberRoyal	4.1		1.0	5.7	5.3	3.3	6.3	4.7	71	90	68	0	4.4	7.0	5.3	
Greenspeed (TAT 720)	3.8		1.0	5.2	5.0	3.0	5.7	4.5	64	90	69	1	4.3	6.7	5.3	
P % varieties	ns		ns	ns	ns	ns	ns	0.7	ns	0.2	ns (13)	ns	ns (9)	0.0	0.9	
LSD 5%								0.3		2				0.7	0.4	
<b>D) Landvik</b>																
Greenspeed (TAT 720)	4.6	4.1	4.2	5.3	3.9	5.5	4.8	5.8	93	25	14	5	5.3	4.5	5.0	1.0
AberRoyal	4.5	4.0	4.4	4.9	4.1	5.2	4.6	5.7	93	25	18	3	5.8	3.6	4.7	1.1
Jorvik (C)	<b>3.8</b>	<b>3.4</b>	<b>3.5</b>	<b>4.3</b>	<b>3.5</b>	<b>4.5</b>	<b>3.7</b>	<b>5.6</b>	<b>89</b>	<b>28</b>	<b>15</b>	<b>10</b>	<b>6.2</b>	<b>3.1</b>	<b>4.9</b>	<b>0.9</b>
Leirin (C)	<b>3.7</b>	<b>3.7</b>	<b>3.9</b>	<b>3.4</b>	<b>4.2</b>	<b>4.0</b>	<b>2.7</b>	<b>4.4</b>	<b>93</b>	<b>27</b>	<b>5</b>	<b>4</b>	<b>5.3</b>	<b>1.7</b>	<b>3.3</b>	<b>1.4</b>
LøEk 0015	3.7	3.8	3.8	3.5	4.1	4.0	3.0	4.7	92	30	2	6	6.8	1.7	4.4	0.9
P % varieties	ns	ns	ns	3.4	ns	ns	1	0.1	ns	0.3	1	ns (12)	0.0	0.0	2	0.1
LSD 5%				1.3			1.2	0.6		2	8		0.5	0.5	0.9	0.2

**Table 4: Varieties of velvet bentgrass (*Agrostis canina*)**

Varieties	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>A) Mean of sites</b>																
Villa (C)	5.2	5.4	3.6	6.2	4.3	5.4	6.3	6.5	87	59	40	6	4.7	5.8	6.1	0.4
Vesper	5.0	5.5	3.4	6.0	4.2	5.3	6.1	6.6	87	58	41	10	5.2	6.4	6.1	0.5
Legendary	5.0	5.4	3.3	6.1	3.9	5.3	6.2	6.6	85	59	44	9	4.7	6.0	6.2	0.5
P % varieties	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	4.5	ns	ns	ns	ns
LSD 5%												2				
P % varieties x sites	3	ns	0.8	4	0.2	ns	ns	ns	ns (7)	ns (13)	0.9	ns	3	1	ns	4
Number of sites	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	2
<b>B) Apelsvoll</b>																
Villa (C)	5.2	5.8	4.8	5.6	3.8	5.3	5.5	7.1	92	64	30	11	4.8	5.3	5.8	0.2
Vesper	4.8	5.8	4.2	5.5	3.3	4.8	5.4	7.2	89	64	43	15	5.0	5.8	5.8	0.4
Legendary	4.5	5.6	3.8	5.5	2.7	4.6	5.1	7.1	86	64	55	17	4.8	5.3	5.8	0.4
P % varieties	4	ns	1		ns (5)	4	ns (11)	ns	4	ns	ns (9)	1	ns (7)	ns	ns	2
LSD 5%	0.5		0.5			0.4			4			3				0.1

Table 4 continued: Varieties of velvet bentgrass (*Agrostis canina*)

	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>C) Keldnaholt</b>																
Vesper	5.0		1.0	7.0	6.0	4.1	7.7	5.4	82	87	57	10	3.9	6.3	4.7	
Legendary	4.9		1.0	6.9	5.3	4.1	8.0	5.5	79	87	60	8	3.9	6.7	4.8	
<b>Villa (C)</b>	<b>4.7</b>		<b>1.0</b>	<b>6.5</b>	<b>5.0</b>	<b>3.8</b>	<b>7.7</b>	<b>5.4</b>	<b>76</b>	<b>88</b>	<b>62</b>	<b>6</b>	<b>3.9</b>	<b>6.2</b>	<b>4.7</b>	
P % varieties	ns		ns	ns	4.9	ns	ns	ns	ns	ns	ns	ns (14)	ns	ns	ns	
LSD 5%					0.8											
<b>D) Landvik</b>																
<b>Villa (C)</b>	<b>5.6</b>	<b>5.0</b>	<b>5.1</b>	<b>6.6</b>	<b>4.2</b>	<b>7.2</b>	<b>5.6</b>	<b>7.0</b>	<b>92</b>	<b>25</b>	<b>28</b>	<b>2</b>	<b>5.4</b>	<b>5.9</b>	<b>7.8</b>	<b>0.6</b>
Legendary	5.5	5.2	5.1	6.0	3.7	7.1	5.4	7.2	92	25	18	3	5.4	6.0	7.9	0.5
Vesper	5.3	5.3	4.9	5.6	3.3	6.9	5.2	7.2	90	24	22	4	6.8	6.9	7.8	0.5
P % varieties	ns	ns	ns	ns	ns (5)	ns	ns	ns (13)	ns	1	ns	ns	0.1	2	ns	ns
LSD 5%										1			0.4	0.6		



**Table 5: Varieties of creeping bentgrass (*Agrostis stolonifera*)**

Varieties	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>A) Mean of sites</b>																
CY-2	4.9	5.3	3.2	6.2	3.9	4.9	6.4	5.4	82	56	58	4	4.7	5.1	4.6	0.6
<b>Independence (C)</b>	<b>4.9</b>	<b>5.1</b>	<b>3.2</b>	<b>6.3</b>	<b>4.1</b>	<b>5.0</b>	<b>6.3</b>	<b>5.6</b>	<b>86</b>	<b>56</b>	<b>57</b>	<b>5</b>	<b>5.0</b>	<b>5.1</b>	<b>4.8</b>	<b>0.6</b>
Runner (IS AP 14)	4.8	4.7	3.2	6.3	4.0	5.1	6.1	5.6	83	56	61	7	4.8	4.7	4.9	0.6
Declaration	4.7	4.5	3.2	5.8	4.0	4.7	6.0	5.5	84	55	53	5	4.8	5.3	4.8	0.5
MacKenzie	4.6	4.9	3.0	6.1	3.9	4.8	5.9	5.4	83	57	57	6	4.7	4.8	4.9	0.6
Sandhill	4.6	4.7	3.1	5.9	3.6	4.7	6.0	5.3	84	56	57	5	5.2	5.0	4.5	0.6
Bengal	4.5	4.8	2.9	5.9	3.5	4.6	6.0	5.3	84	57	57	8	4.9	4.9	4.8	0.6
L93	4.5	4.8	3.0	5.7	3.7	4.6	5.7	5.1	86	57	53	5	4.9	4.3	4.3	0.7
Alpha	4.5	4.6	2.8	5.8	3.7	4.5	5.8	5.0	83	56	55	7	4.9	4.8	4.3	0.6
Norwegian type	4.5	4.8	3.6	4.5	4.7	4.2	4.7	5.0	85	57	27	3	5.0	3.5	4.6	1.0
P % varieties	ns	3	ns	0.6	ns	ns	0.2	ns	ns	ns	ns	ns	ns	ns (6)	ns	2
LSD 5%		0.5		0.6			0.7									0.1
P % varieties x sites	3	ns	0.0	ns	0.0	0.4	ns	0.0	0.0	2	0.0	ns (13)	0.0	0.3	0.0	ns
Number of sites	3	2	3	3	3	3	3	3	3	2	3	3	3	3	3	2
<b>B) Apelsvoll</b>																
Norwegian type	5.0	5.6	5.2	3.7	4.2	4.7	4.4	5.5	93		16	6	5.1	4.3	4.2	0.6
CY-2	4.3	6.0	3.2	5.8	1.3	4.4	5.6	4.7	77		92	9	4.6	4.0	4.0	0.4
Sandhill	4.3	5.7	3.4	5.9	1.2	4.7	5.7	4.6	80		96	7	4.8	5.0	4.0	0.4
MacKenzie	4.3	5.6	3.2	6.2	1.3	4.6	6.0	4.7	78		94	9	4.7	4.7	4.1	0.4
L93	4.2	5.8	3.2	5.5	1.7	4.3	5.3	4.6	81		86	6	4.7	4.5	4.1	0.5
<b>Independence (C)</b>	<b>4.1</b>	<b>5.7</b>	<b>3.1</b>	<b>5.5</b>	<b>1.3</b>	<b>4.3</b>	<b>5.5</b>	<b>4.7</b>	<b>80</b>		<b>93</b>	<b>11</b>	<b>4.8</b>	<b>4.8</b>	<b>4.3</b>	<b>0.4</b>
Runner (IS AP 14)	4.1	5.4	3.1	5.8	1.3	4.4	5.6	4.7	78		93	11	4.7	4.3	4.3	0.3
Alpha	4.0	5.5	3.1	5.4	1.3	4.2	5.3	4.5	77		92	10	4.7	4.5	4.1	0.4
Bengal	4.0	5.6	3.0	5.3	1.0	4.1	5.3	4.6	78		97	12	4.7	4.5	4.3	0.4
Declaration	3.8	5.3	3.0	4.5	1.7	3.6	5.0	4.6	78		88	7	4.7	4.3	4.0	0.3
P % varieties	0.1	ns	0.0	0.0	0.0	1.5	0.3	0.0	0.0		0.0	0.0	0.0	0.0	0.0	ns (12)
LSD 5%	0.4		0.4	0.9	0.6	0.5	0.6	0.3	3		9	2	0.1	0.3	0.2	

Table 5 continued: Varieties of creeping bentgrass (*Agrostis stolonifera*)

	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>C) Keldnaholt</b>																
CY-2	5.1		1.0	7.2	5.7	4.3	8.0	5.4	77	88	56	2	3.9	6.8	5.0	
<b>Independence (C)</b>	<b>4.9</b>		<b>1.0</b>	<b>6.9</b>	<b>5.7</b>	<b>4.0</b>	<b>8.0</b>	<b>5.3</b>	<b>84</b>	<b>88</b>	<b>53</b>	<b>4</b>	<b>3.7</b>	<b>5.7</b>	<b>4.8</b>	
Runner (IS AP 14)	4.7		1.0	6.5	5.3	3.8	7.3	5.2	81	89	58	8	3.8	5.7	4.8	
Bengal	4.7		1.0	6.5	5.3	3.8	7.7	5.2	83	90	54	10	3.8	5.8	5.2	
Alpha	4.7		1.0	6.5	5.0	3.8	7.7	4.9	81	89	57	8	3.8	6.2	4.8	
Sandhill	4.6		1.0	6.3	5.0	3.8	7.3	5.2	80	89	56	5	4.0	6.0	4.8	
L93	4.6		1.0	6.3	4.7	3.8	7.3	5.1	82	90	54	7	3.8	5.5	5.0	
Declaration	4.5		1.0	6.3	5.0	3.7	7.3	5.2	79	88	56	7	3.7	6.2	4.5	
MacKenzie	4.4		1.0	6.2	5.3	3.6	7.0	5.0	77	90	55	7	3.7	6.2	5.2	
Norwegian type	3.9		1.0	5.4	5.0	3.2	6.0	4.6	69	87	60	2	4.1	4.3	5.0	
P % varieties	ns (5)		ns	ns (5)	ns	4.0	ns	3	ns (10)	ns (12)	ns	ns	ns	0.7	ns (6)	
LSD 5%						0.7		0.6						1.3		
<b>D) Landvik</b>																
Declaration	5.7	3.8	5.7	6.6	5.4	6.9	5.8	6.7	95	23	16	1	6.0	5.3	6.0	0.8
Runner (IS AP 14)	5.7	4.0	5.5	6.7	5.5	7.0	5.4	6.8	92	23	33	1	6.1	4.2	5.7	0.8
<b>Independence (C)</b>	<b>5.6</b>	<b>4.5</b>	<b>5.4</b>	<b>6.4</b>	<b>5.3</b>	<b>6.8</b>	<b>5.3</b>	<b>6.8</b>	<b>93</b>	<b>24</b>	<b>26</b>	<b>2</b>	<b>6.5</b>	<b>4.7</b>	<b>5.3</b>	<b>0.8</b>
CY-2	5.3	4.6	5.4	5.6	4.6	6.0	5.6	6.1	92	24	27	2	5.6	4.5	4.9	0.7
MacKenzie	5.2	4.1	5.0	6.1	5.0	6.3	4.8	6.4	93	24	23	2	5.8	3.7	5.5	0.8
Bengal	5.0	3.9	4.6	5.8	4.3	5.9	5.2	6.1	92	24	21	3	6.4	4.4	5.0	0.8
Sandhill	4.9	3.8	4.9	5.5	4.5	5.8	5.0	6.0	93	24	21	2	6.6	4.0	4.5	0.9
L93	4.8	3.9	4.7	5.4	4.8	5.6	4.3	5.6	94	24	18	1	6.2	2.9	4.0	0.9
Alpha	4.7	3.8	4.4	5.6	4.6	5.5	4.5	5.6	92	23	17	2	6.3	3.6	4.0	0.9
Norwegian type	4.5	4.1	4.7	4.4	4.9	4.9	3.8	5.0	94	26	5	2	6.0	1.8	4.5	1.4
P % varieties	ns (6)	ns	ns	ns	ns	ns (6)	ns	0.6	ns	ns (7)	0.8	ns	2	1	0.0	0.2
LSD 5%								0.9			11		0.6	1.5	0.5	0.2

**Table 6: Varieties of chewing fescue (*Festuca rubra* var. *commutata*)**

Varieties	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>A) Mean of sites</b>																
Musica	6.0	5.3	6.2	6.0	4.9	6.4	6.3	6.0	96	55	10	1	5.0	4.2	7.8	1.3
Greensleeves	5.7	4.7	6.3	5.4	5.1	6.1	5.6	5.7	94	55	12	1	5.2	4.2	7.7	1.2
Barswing	5.7	5.2	6.0	5.7	4.5	6.2	5.7	5.8	96	55	12	1	5.0	3.8	7.8	1.1
Margret	5.6	4.7	6.4	5.3	4.6	6.1	5.6	5.4	96	55	8	2	5.1	3.5	7.7	1.0
Charme (Frc 04210)	5.6	4.9	6.2	5.3	4.9	6.0	5.4	5.4	96	55	10	1	5.3	3.4	7.7	1.1
LøRc 0215	5.6	4.5	6.0	5.3	4.8	5.9	5.7	5.4	96	55	9	1	5.0	3.5	7.7	1.2
SW RSC6028	5.5	4.5	6.1	5.3	4.8	6.0	5.3	5.4	96	56	9	1	5.0	3.6	7.7	1.2
SW RSC6101	5.5	4.2	6.1	5.0	5.0	5.8	5.2	5.3	95	56	6	1	5.1	3.5	7.6	1.0
<b>Center (C)</b>	<b>5.5</b>	<b>4.9</b>	<b>6.0</b>	<b>5.2</b>	<b>4.3</b>	<b>5.9</b>	<b>5.4</b>	<b>5.4</b>	<b>94</b>	<b>56</b>	<b>18</b>	<b>1</b>	<b>5.0</b>	<b>3.5</b>	<b>7.7</b>	<b>1.1</b>
Excellence	5.3	4.3	5.6	5.3	4.8	5.7	5.4	5.5	95	55	11	1	5.5	3.6	7.6	1.2
LøRc 0021 (Linda)	5.3	3.8	5.7	5.2	4.8	5.7	5.4	5.3	95	56	7	1	5.0	3.7	7.6	1.1
P % varieties	ns	0.1	ns	ns	ns	ns	ns	4	ns (12)	ns	ns	ns	ns (7)	0.1	ns	ns
LSD 5%		0.4						0.2						0.3		
P % varieties x sites	0.3	ns	ns (7)	0.0	ns	0.0	0.6	0.0	ns (12)	0.8	ns	ns	0.0	4.5	0.4	ns
Number of sites	3	2	3	3	3	3	3	3	3	3	3	3	3	3	2	2
<b>B) Apelsvoll</b>																
Musica	5.2	5.0	5.0	5.8	3.8	5.4	6.2	4.9	96	58	16	0	4.9	4.2	7.5	1.1
SW RSC6028	5.1	4.2	5.3	5.3	4.3	5.4	5.5	4.6	96	58	8	0	4.8	4.0	7.5	0.9
Barswing	5.0	5.1	4.7	6.0	3.7	5.5	5.5	5.0	95	58	19	1	4.6	4.2	7.5	0.8
Charme (Frc 04210)	5.0	4.6	5.1	5.3	4.3	5.2	5.3	4.6	95	58	15	0	4.9	3.7	7.5	0.8
LøRc 0215	4.9	4.0	5.3	4.9	4.7	5.1	5.3	4.6	96	58	11	0	4.8	3.7	7.5	1.1
Excellence	4.9	4.2	5.1	5.3	4.2	5.3	5.5	4.5	95	58	17	0	4.9	3.7	7.5	0.8
Margret	4.9	4.3	5.0	5.1	4.5	5.1	5.3	4.5	96	58	7	0	4.8	3.7	7.5	0.7
Greensleeves	4.8	4.3	5.0	4.6	4.5	4.9	4.9	4.8	94	58	12	0	5.0	4.2	7.5	0.9
SW RSC6101	4.8	4.0	5.3	4.3	4.7	4.8	5.0	4.4	96	58	2	0	4.8	3.7	7.5	0.7
<b>Center (C)</b>	<b>4.7</b>	<b>4.5</b>	<b>4.7</b>	<b>5.2</b>	<b>3.7</b>	<b>5.0</b>	<b>5.3</b>	<b>4.5</b>	<b>91</b>	<b>58</b>	<b>29</b>	<b>0</b>	<b>4.8</b>	<b>3.5</b>	<b>7.5</b>	<b>0.9</b>
LøRc 0021 (Linda)	4.5	3.4	4.9	4.3	4.7	4.7	4.6	4.2	94	58	5	0	4.7	4.2	7.5	0.9
P % varieties	ns	0.0	ns	0.0	ns	ns	2	0.7	ns	ns	ns	0.0	ns (5)	0.6	ns	ns
LSD 5%		0.0		0.6			0.7	0.4				0.2		0.4		

Table 6 continued: Varieties of chewing fescue (*Festuca rubra* var. *commutata*)

	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>C) Keldnaholt</b>																
LøRc 0215	7.1		7.7	6.8	4.3	7.5	8.0	6.7	94	83	15	2	4.9	4.7		
SW RSC6101	7.0		8.0	6.5	5.0	7.5	7.0	6.8	93	85	17	3	5.2	4.8		
Greensleeves	6.9		8.0	6.4	5.0	7.4	7.0	6.8	90	84	23	3	4.9	5.5		
Charme (Frc 04210)	6.8		8.0	6.2	4.7	7.3	6.7	6.5	94	83	15	2	5.1	4.5		
Margret	6.7		8.3	5.8	3.7	7.3	7.0	6.4	94	83	14	5	4.8	4.8		
Musica	6.6		7.0	6.4	4.3	7.0	7.3	6.7	94	84	12	3	4.9	5.2		
LøRc 0021 (Linda)	6.6		7.0	6.3	4.3	6.9	7.3	6.6	92	85	17	2	5.0	4.7		
SW RSC6028	6.6		7.7	6.0	4.7	7.1	6.3	6.4	93	84	18	3	4.9	4.7		
<b>Center (C)</b>	<b>6.4</b>		<b>7.7</b>	<b>5.8</b>	<b>3.7</b>	<b>7.0</b>	<b>6.7</b>	<b>6.3</b>	<b>91</b>	<b>84</b>	<b>21</b>	<b>2</b>	<b>4.6</b>	<b>4.5</b>		
Barswing	6.3		7.0	6.0	4.0	6.8	6.7	6.6	93	83	17	2	4.8	5.0		
Excellence	6.3		6.3	6.3	4.7	6.6	6.7	6.6	93	83	16	2	5.3	5.0		
P % varieties	ns		ns	ns	ns	ns	ns	ns	3	ns	ns (6)	ns	4.6	4.7		
LSD 5%									2				0.3	0.6		
<b>D) Landvik</b>																
Musica	6.1	5.6	6.6	5.9	6.5	6.9	5.3	6.3	99	23	2	0	5.3	3.3	8.1	1.4
Barswing	5.6	5.4	6.2	5.2	5.8	6.3	5.0	5.8	99	24	1	0	5.7	2.3	8.2	1.4
Greensleeves	5.4	5.1	5.8	5.2	5.8	5.9	4.8	5.6	99	23	1	0	5.7	3.0	8.0	1.4
Margret	5.3	5.1	5.7	5.0	5.7	5.9	4.5	5.3	99	24	2	0	5.6	2.1	7.8	1.4
<b>Center (C)</b>	<b>5.2</b>	<b>5.4</b>	<b>5.7</b>	<b>4.7</b>	<b>5.6</b>	<b>5.5</b>	<b>4.4</b>	<b>5.3</b>	<b>98</b>	<b>25</b>	<b>3</b>	<b>0</b>	<b>5.6</b>	<b>2.4</b>	<b>8.0</b>	<b>1.4</b>
Charme (Frc 04210)	5.1	5.2	5.5	4.6	5.7	5.3	4.2	5.1	98	24	1	0	5.7	2.0	7.9	1.3
SW RSC6028	5.0	4.9	5.3	4.6	5.4	5.4	4.1	5.2	98	25	1	0	5.2	2.0	7.9	1.5
LøRc 0021 (Linda)	5.0	4.3	5.2	5.0	5.4	5.5	4.3	5.1	98	25	1	0	5.3	2.3	7.8	1.4
Excellence	4.8	4.3	5.4	4.5	5.4	5.2	4.1	5.3	96	25	1	0	6.4	2.1	7.6	1.5
LøRc 0215	4.8	5.0	5.1	4.4	5.4	5.0	3.9	4.9	98	24	1	0	5.3	2.3	7.9	1.4
SW RSC6101	4.6	4.5	5.0	4.2	5.2	4.9	3.6	4.7	97	25	0	0	5.4	2.1	7.7	1.4
P % varieties	0.0	1	0.0	0.0	0.4	0.0	0.0	0.0	0.1	1	ns	ns	0.0	0.0	1	ns
LSD 5%	0.4	0.7	0.5	0.6	0.5	0.6	0.6	0.3	1	1			0.3	0.5	0.3	

**Table 7: Varieties of slender creeping fescue (*Festuca rubra* var. *trichophylla*)**

Varieties	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>A) Mean of sites</b>																
Finesto (Frt 04213)	5.6	4.1	5.8	5.8	4.4	6.1	6.2	5.7	94	55	16	1	4.5	4.5	7.8	1.1
Amarone	5.5	4.4	5.9	5.5	4.6	6.0	5.7	5.6	92	55	22	1	4.6	4.4	7.7	0.9
Viktorka	5.5	4.1	5.5	6.0	4.6	6.1	6.0	5.9	92	56	21	1	5.0	4.4	7.8	0.9
<b>Cezanne (C)</b>	<b>5.2</b>	<b>3.3</b>	<b>5.3</b>	<b>5.5</b>	<b>4.4</b>	<b>5.6</b>	<b>5.6</b>	<b>5.5</b>	<b>91</b>	<b>55</b>	<b>12</b>	<b>1</b>	<b>4.7</b>	<b>4.4</b>	<b>7.6</b>	<b>0.9</b>
Niola	5.1	3.3	5.6	5.0	4.2	5.6	5.3	5.3	93	56	11	1	5.0	4.7	7.6	0.9
Corrida	5.1	3.3	5.5	5.0	4.1	5.4	5.5	5.2	92	56	18	1	5.0	4.5	7.5	1.0
P % varieties	ns	ns	1.6	ns (10)	ns	ns	ns	ns	ns	ns	ns	ns	ns (9)	ns	ns	ns
LSD 5%																
P % varieties x sites	0.0	3	2	2	4	0.0	2	0.0	0.6	ns (6)	ns	1	0.2	0.0	0.2	ns
Number of sites	3	2	3	3	3	3	3	3	3	3	3	3	3	3	2	2
<b>B) Apelsvoll</b>																
<b>Cezanne (C)</b>	<b>4.7</b>	<b>3.8</b>	<b>4.9</b>	<b>5.2</b>	<b>3.7</b>	<b>5.2</b>	<b>5.2</b>	<b>4.7</b>	<b>93</b>	<b>58</b>	<b>10</b>	<b>0</b>	<b>4.9</b>	<b>4.0</b>	<b>7.5</b>	<b>0.8</b>
Niola	4.5	3.6	4.9	4.4	4.2	4.6	5.0	4.6	95	58	7	0	4.8	5.0	7.5	0.7
Finesto (Frt 04213)	4.5	4.2	4.5	4.7	3.2	4.7	5.1	4.6	93	58	28	0	4.5	4.0	7.5	0.8
Amarone	4.2	4.0	4.2	4.4	3.2	4.5	4.4	4.3	89	58	42	0	4.8	4.7	7.5	0.7
Viktorka	4.1	4.3	3.8	4.9	2.8	4.4	4.8	4.5	88	58	40	0	4.8	4.2	7.5	0.7
Corrida	4.1	3.6	4.3	4.0	3.5	4.3	4.2	4.3	92	58	28	0	4.9	4.0	7.5	0.7
P % varieties	ns	ns (5)	ns	2	ns	ns (6)	ns (7)	ns	ns	ns	ns	ns	ns	0.7	ns	ns
LSD 5%				0.6										0.5		

Table 6 continued: Varieties of creeping fescue (*Festuca rubra* var. *trichophylla*)

	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>C) Keldnaholt</b>																
Amarone	6.8		7.7	6.4	5.3	7.1	7.3	6.6	90	86	22	1	4.4	4.7		
Viktorka	6.8		6.7	6.8	6.0	6.8	7.3	7.1	92	87	21	2	4.6	4.7		
Corrida	6.6		7.3	6.3	4.3	6.9	7.7	6.6	90	87	26	2	4.5	5.3		
<b>Cezanne (C)</b>	<b>6.4</b>		<b>6.3</b>	<b>6.5</b>	<b>5.0</b>	<b>6.6</b>	<b>7.3</b>	<b>6.9</b>	<b>89</b>	<b>84</b>	<b>26</b>	<b>1</b>	<b>4.4</b>	<b>5.3</b>		
Niola	6.4		7.3	5.9	4.3	6.8	6.7	6.4	89	86	26	3	4.5	5.0		
Finesto (Frt 04213)	6.3		6.7	6.2	4.3	6.5	7.7	6.5	92	84	20	1	4.3	4.8		
P % varieties	ns		ns	ns	1	ns	ns	4	4.8	ns (12)	ns (14)	4.5	ns	ns (14)		
LSD 5%								0.4	2			1				
<b>D) Landvik</b>																
Finesto (Frt 04213)	5.9	4.0	6.2	6.4	5.7	7.1	5.9	6.2	98	23	2	0	4.7	4.6	8.0	1.3
Viktorka	5.7	3.8	6.1	6.1	5.0	7.0	5.8	6.1	97	23	2	0	5.6	4.5	8.1	1.2
Amarone	5.6	4.8	5.9	5.7	5.4	6.4	5.4	5.9	98	23	2	0	4.8	4.0	8.0	1.2
Corrida	4.4	3.0	4.8	4.7	4.4	5.0	4.7	4.8	96	23	0	0	5.5	4.1	7.5	1.2
Niola	4.3	3.0	4.7	4.7	4.2	5.2	4.3	4.9	94	23	1	1	5.7	4.0	7.7	1.2
<b>Cezanne (C)</b>	<b>4.3</b>	<b>2.8</b>	<b>4.6</b>	<b>4.9</b>	<b>4.5</b>	<b>5.0</b>	<b>4.3</b>	<b>4.9</b>	<b>90</b>	<b>23</b>	<b>1</b>	<b>1</b>	<b>4.8</b>	<b>3.8</b>	<b>7.7</b>	<b>1.0</b>
P % varieties	0.1	0.9	0.0	1	0.5	0.1	2	0.0	0.0	ns	ns	ns (11)	0.0	0.1	0.9	3
LSD 5%	0.7	1.0	0.6	1.0	0.7	0.9	1.1	0.5	3				0.4	0.3	0.3	0.2

**Table 8: Varieties of perennial ryegrass (*Lolium perenne*)**

Varieties	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>A) Mean of sites</b>																
Chardin (DP 17-2147)	4.7	4.5	5.3	4.5	3.3	5.0	4.6	4.4	86	56	45	1	4.7	4.8	4.1	1.4
Madrid	4.3	4.2	4.6	4.2	2.8	4.5	4.5	3.9	86	58	49	1	5.4	5.1	3.5	1.4
Ligala	4.1	4.0	4.8	3.9	3.1	4.5	3.8	3.9	85	57	44	1	4.8	4.8	4.0	1.4
DP 17-9974	4.1	4.0	4.5	3.9	3.2	4.3	3.7	4.0	84	58	42	1	5.6	5.4	3.9	1.4
Mascot (INLP 634)	4.0	3.8	4.4	3.7	3.1	4.1	3.9	3.9	83	57	43	1	4.8	4.9	3.9	1.3
P % varieties	3	ns (7)	4	ns (11)	ns	3	ns (6)	ns	ns	ns	ns	ns	4	ns	ns	ns
LSD 5%	0.3		1.1			0.3							0.2			
P % varieties x sites	ns	ns	ns	ns (9)	ns (12)	ns (6)	ns	0.1	0.2	1	0.0	ns	0.0	0.0	0.0	3
Number of sites	3	2	3	3	3	3	3	3	3	2	3	3	3	3	3	2
<b>B) Apelsvoll</b>																
Chardin (DP 17-2147)	3.4	4.0	2.6	4.9	1.0	4.0	4.0	2.4	79		100	2	4.5	4.2	3.0	1.0
Madrid	2.9	3.6	2.3	4.1	1.0	3.4	3.2	2.0	77		100	2	4.9	5.7	2.8	1.1
Ligala	2.6	3.2	1.8	4.3	1.0	3.2	3.0	2.1	73		100	2	4.5	5.2	2.8	1.0
DP 17-9974	2.5	3.3	1.8	4.0	1.0	3.0	2.9	1.9	73		100	2	5.2	5.7	2.8	1.2
Mascot (INLP 634)	2.3	3.0	1.7	3.6	1.0	2.7	2.8	1.9	72		100	2	4.5	4.8	2.8	1.0
P % varieties	0.4	2	0.7	4	ns	0.3	2	0.1	1		ns	ns	1	0.0	ns	ns
LSD 5%	0.4	0.5	0.5	0.8		0.5	0.7	0.2	4				0.4	0.5		

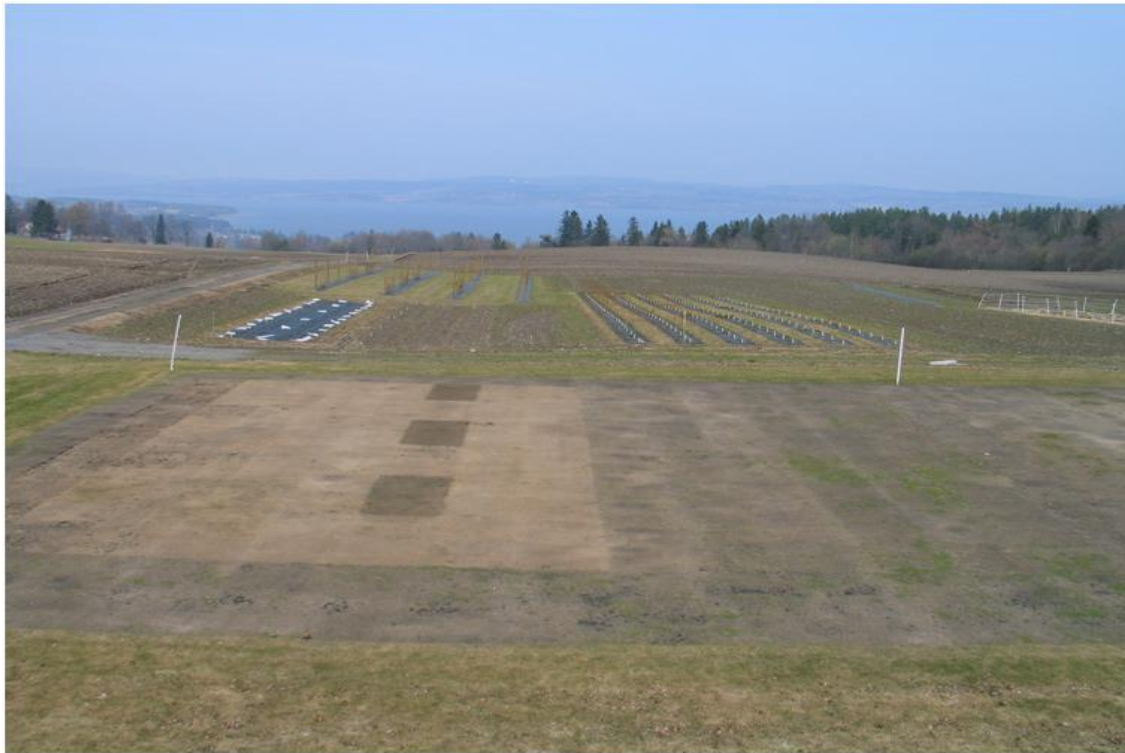
Table 8 continued: Varieties of perennial ryegrass (*Lolium perenne*)

	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>C) Keldnaholt</b>																
Madrid	6.7		8.3	5.9	4.7	7.1	7.3	6.8	90	90	24	0	4.9	5.7	4.6	
Chardin (DP 17-2147)	6.6		8.7	5.6	5.0	7.0	6.7	6.6	86	90	34	0	4.8	6.0	4.6	
Mascot (INLP 634)	6.4		8.0	5.7	5.0	6.8	6.7	6.6	88	89	28	0	4.8	6.2	4.6	
DP 17-9974	6.4		8.0	5.6	5.0	6.8	6.0	6.5	89	90	25	0	5.0	6.2	4.8	
Ligala	6.3		8.3	5.3	4.7	6.8	5.7	6.2	88	90	29	0	4.6	5.5	4.8	
P % varieties	ns		ns	ns	ns	ns	ns	ns (14)	ns	ns	ns (14)	ns	ns (9)	ns	ns	
LSD 5%																
<b>D) Landvik</b>																
Chardin (DP 17-2147)	4.0	5.1	4.6	2.9	4.0	4.1	3.2	4.1	92	23	2	2	4.9	4.2	4.7	1.8
Ligala	3.5	4.9	4.1	2.3	3.6	3.5	2.6	3.5	93	25	2	2	5.3	3.8	4.4	1.9
DP 17-9974	3.3	4.6	3.7	2.1	3.5	3.1	2.3	3.6	91	26	0	2	6.5	4.3	4.0	1.7
Madrid	3.2	4.8	3.2	2.5	2.7	3.0	2.9	3.0	90	26	23	2	6.2	4.0	3.2	1.8
Mascot (INLP 634)	3.1	4.6	3.6	1.8	3.2	2.9	2.2	3.1	89	25	0	2	5.3	3.6	4.2	1.6
P % varieties	3	ns	1	2	0.4	0.1	ns	0.6	ns	0.8	0.0	ns	0.0	ns (6)	0.3	1
LSD 5%	0.5		0.7	0.5	0.5	0.4		0.5		1	4		0.5		1.9	0.2



**Table 9: Varieties of rough-stalked meadow grass (*Poa trivialis*)**

Varieties	Visual merit (1-9)							Tiller density (1-9)	Plant cover %	Greenup days after 28.Feb	Winter damage %	In season diseases (1-9)	Colour (1-9)	Dormancy colour (1-9)	Leaf fineness (1-9)	Height increment mm/day
	Overall mean	Sowing Year	Green Year 1	Green Year 2	Spring	Summer	Autumn									
<b>A) Mean of sites</b>																
Racehorse	4.6	5.5	4.2	4.9	3.6	4.5	5.1	4.6	83	57	49	1	5.4	4.2	4.5	1.0
Qasar	4.6	5.7	4.2	4.7	3.5	4.5	5.0	4.6	83	57	49	1	5.5	4.1	4.6	1.0
P % varieties	ns	3.7	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
LSD 5%		0.2														
P % varieties x sites	ns	ns	2	ns	ns	ns	ns (7)	ns	ns (5)	ns	ns	ns	ns	ns	ns	ns
Number of sites	3	2	3	3	3	3	3	3	3	2	3	3	3	3	3	2
<b>B) Apelsvoll</b>																
Racehorse	3.7	4.8	2.6	5.8	1.0	4.1	5.3	2.9	79		100	0	4.6	4.0	3.8	0.9
Qasar	3.5	5.0	2.4	5.4	1.0	3.9	4.8	2.9	77		100	0	4.6	4.0	3.8	1.0
P % varieties	ns	ns (7)	ns	ns	ns	ns	ns	ns	ns (8)	ns	ns	ns	ns	ns	ns	ns
LSD 5%																
<b>C) Keldnaholt</b>																
Racehorse	6.4		6.0	6.7	5.7	6.3	8.0	6.4	92	87	45	0	6.0	6.5	4.3	
Qasar	6.4		6.0	6.6	5.3	6.3	8.0	6.4	93	86	45	0	6.0	6.3	4.3	
P % varieties	ns		ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
LSD 5%																
<b>D) Landvik</b>																
Qasar	3.9	6.4	4.3	2.2	4.1	3.4	2.2	4.5	80	27	2	2	5.8	1.9	5.7	1.1
Racehorse	3.7	6.2	3.9	2.2	4.0	3.2	2.0	4.4	79	27	2	3	5.7	2.0	5.5	1.1
P % varieties	0.4	ns	ns (14)	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
LSD 5%	0.1															



**Photo 1. Winter killed green at Apelsvoll, 24 April 2009. (Photo: Bjørn Molteberg)**



**Photo 2. Re-sown (19 May) green and STERF Velvet bentgrass project reference group meeting at Apelsvoll, 9 June 09. (Photo: Agnar Kvalbein)**



Photo 3. Re-sown (19 May) green at Apelsvoll, 17 September 2009. (Photo: Bjørn Molteberg)



Photo 4. Good over wintering at Landvik, 17 Mars 2009, five days after snow melt. Plots with green colour in the first and second column are perennial ryegrasses. In the third, fourth and fifth column slender creeping red fescues and to the far right rough-stalked meadow grass. Other, mostly dormant plots chewings fescues (Photo: Trygve S. Aamlid)





**Photo 5. The experimental green at Keldnaholt, 22 June 2009. (Photo: Bjørn Molteberg)**



**Photo 6. The variety green at Landvik, 2 September 2009. (Photo: Trygve S. Aamlid)**





**Photo 7. Aerification with Verti Drain before the winter at Apelsvoll, 7 October 2009. (Photo: Bjørn Molteberg)**



**Photo 8. The variety green at Keldnaholt, 18 August 2009. The mowing height was 5.5 mm for all species. (Photo: Gudni Thorvaldsson)**





Photo 9. 'Leirin' has wider leaves and lower density than 'Jorvik'. Landvik, 3 September 2008. (Photo: Trygve S. Aamlid)



Photo 10. 'Vesper' is darker than 'Villa'. Landvik, 3 September 2008. (Photo: Trygve S. Aamlid)





Photo 11. Creeping bentgrass 'Independence' at Landvik, 2 September 2009. (Photo: Bjørn Molteberg)



Photo 12. Chewings fescue 'Musica' at Apelsvoll, 17 September 2009. (Photo: Bjørn Molteberg)





Photo 13. Slender creeping red fescue 'Finesto' (Frt 04213) at Landvik, 2 September 2009. (Photo: Bjørn Molteberg)



Photo 14. 'Chardin' (DP 17-2147) was ranked significantly before the other perennial ryegrass varieties in climate zone 1 and 2. Apelsvoll, 17 September 2008. (Photo: Bjørn Molteberg)