



What is the best seed mixture for putting greens?

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Photo 1: The blends and mixtures at Landvik in February 2022. Border row in the middle with pure fescue, row to the right with high N/low mow and row to the left with low N/high mow. Photo: Karin J. Hesselsøe.

The testing seed mixtures of fescue, bentgrass and perennial ryegrass in SCANGREEN 2019-22 was completed in November 2022. The research questions were:

- **Will a mixture of fescue (*Festuca rubra*) and creeping bentgrass (*Agrostis stolonifera*) perform better than the traditional mixture of fescue and colonial bentgrass (*Agrostis capillaris*)?**
- **How does a mixture of fescue and both bentgrasses perform?**
- **Can a mixing in perennial ryegrass (*Lolium perenne*) in a creeping bentgrass improve establishment and turfgrass quality?**

The varieties of colonial bentgrass and creeping bentgrass used in these trials were ‘Greenspeed’ and ‘Pure Distinction’, respectively. With these varieties, we cannot recommend the mixture of fescue and creeping bentgrass in favor of the traditional mixture with colonial bentgrass, because the creeping bentgrass outcompeted the

fescue. But at some sites and management levels the mixture with creeping bentgrass is to prefer. The mixture with creeping bentgrass and perennial ryegrass established significantly faster than any of the others, but after the first winter, turfgrass quality decreased compared to the other mixtures.

Experiments were conducted at NIBIO-Landvik and at Smørum GC - both at two maintenance levels – low input (110 kg N/ha/yr and 5 mm mowing) and high input (170 kg N/ha/yr and 3 mm mowing). Preliminary results (2020-2021) have been published in GCM-magazine (Hesselsøe et al., 2022).

Why do we test new seed mixtures?

About 50% of the golf courses in Scandinavia have greens initially seeded with a mixture of colonial bentgrass and red fescue. Over time

these greens often suffer from diseases - mainly *Microdochium* patch (*Microdochium nivale*) and the ingression of annual bluegrass (*Poa annua*). Creeping bentgrass has high tiller density which makes it more competitive to annual bluegrass, and the new varieties of creeping bentgrass have also higher disease resistance compared to varieties of colonial bentgrass.

Results from SCANGREEN 2015-18 showed that red fescue plus creeping bentgrass ‘Independence’ produced greens of equal quality and with less *Microdochium* patch than red fescue plus colonial bentgrass ‘Jorvik’ (Aamlid et al., 2019), and we wanted to see if these results were valid also with other bentgrass varieties.

The different mixtures

Five mixtures/blends were compared (Table 1): A seed blend of red fescue only – FR. FR + AC – a red fescue

Table 1: Treatment codes, seed blends and mixtures in weight ratios.

Treatment code	Seed blends and mixtures	Weight ratios in %
FR	Red fescue seed blend	100
FR + AC	Red fescue seed blend + Colonial bentgrass	85/15
FR + AS	Red fescue seed blend + Creeping bentgrass	85/15
FR + AC + AS	Red fescue seed blend + Colonial bentgrass + Creeping bentgrass	85/7.5/7.5
AS + LP	Creeping bentgrass + perennial ryegrass	20/80

seed blend in mixture with colonial bentgrass - which is the traditional mixture for golf greens in Scandinavia with a weight ratio of 85 % red fescue and 15 % colonial bentgrass. An alternative to this mixture: FR + AS – where colonial bentgrass was changed to creeping bentgrass with the same weight ratios, and a triple mixture (FR + AC + AS) including all three species where the 15 % bentgrass ratio was divided equally between colonial and creeping bentgrass. Additionally, a mixture of creeping bentgrass and perennial ryegrass (AS + LP) with the weight ratios 20/80 was tested.

Varieties used for the mixtures were: slender creeping red fescue ‘Cezanne’ and two Chewings fescues ‘Musica’ and ‘Barlineus’. The varieties of colonial and creeping bentgrass were ‘Greenspeed’ and ‘Pure Distinction’ and perennial ryegrass was ‘Clementine’.

The greens were maintained at two levels regarding fertilizer input and mowing height. One section was low input (110 kg N/ha/yr and 5 mm mowing height), the other section was high input (170 kg N/ha/yr and 3 mm mowing height). The greens were mown three times per week and deficit-irrigated to 80% of field capacity three to four times per week in periods without sufficient natural rainfall. Fertilizer (mean N–P–K ratio, 100–22–74) was given as completely balanced compound fertilizers every second week. Wear was simulated using friction wear drums, and there

was no use of pesticides in any of the trials.

Turfgrass visual quality was assessed once a month from April or May to November on a scale from 1 to 9, where 9 is the highest quality and 5 is the lowest acceptable quality. The turfgrass quality shown in Figure 1 is an overall mean of two years testing at Smørum and four years at Landvik. Coverage of ‘microdochium patch during winter’ was recorded visually as a percentage of plot area immediately after snow melt (or at first assessment after winter).

Creeping bentgrass slightly better than colonial bentgrass in mixture with fescue

At Landvik there were only small differences in turfgrass quality between the mixtures (Figure 1).

At low input the mixture of creeping bentgrass and ryegrass (AS + LP) had significantly lower turfgrass quality than the others. At high input the mixture with fescue and creeping bentgrass tended to have the highest quality, and the mixture with fescue

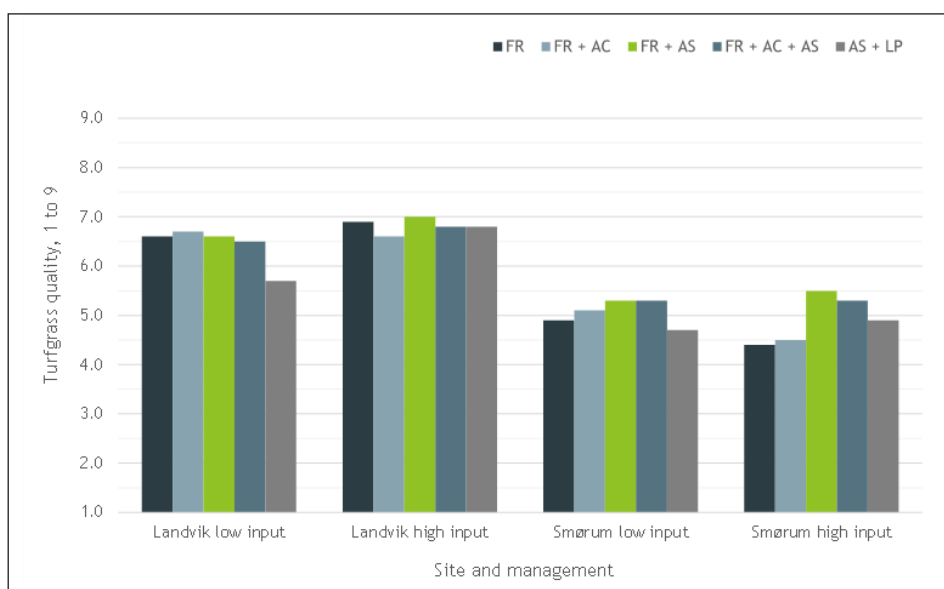


Figure 1: Turfgrass quality (overall mean) of the five mixtures at Landvik and Smørum at low input (110 kg N/ha/yr and 5 mm mowing height) and high input (170 kg N/ha/yr and 3 mm mowing height). Black column is pure fescue blend (FR), light blue column is mixture of fescue and colonial bentgrass (FR + AC), green column is mixture of fescue and creeping bentgrass (FR + AS), dark blue column is triple mixture (FR + AC + AS) and grey column is mixture of creeping bentgrass and perennial ryegrass (AS + LP).

and colonial bentgrass the lowest quality, but they were not significantly different.

At Smørum the mixture with fescue and creeping bentgrass (FR + AS) and the triple mixture with both creeping and colonial bentgrass (FR + AC + AS) tended to be highest at low input, but no significant differences were found. At high input the mixture with fescue and creeping bentgrass (FR + AS) was significantly better than the mixture with fescue and colonial bentgrass (FR + AC) (Figure 1).

Coverage of microdochium patch during winter at the two sites – Landvik and Smørum – differed a lot with the highest disease cover at Landvik (Figure 2).

Data from Smørum is not shown as here was only results from one year (March 2022). At Landvik the fescue seed blend FR had lower winter damages and disease than any of the mixtures, while the mixture with creeping bentgrass and ryegrass (AS + LP) had the highest coverage of disease at both low and high input.

Does creeping bentgrass outcompete fescue in mixture?

The fescue/bentgrass ratio in all mixtures of fescue and bentgrass was determined at Landvik in October 2020 and again in 2021. Five random samples were taken as small cylinders (2.8 cm²) from each plot and the number of tillers of each species was counted under a magnifying lens. In 2020 the proportion between red fescue and bentgrass was in favor of the bentgrasses at high input with the highest proportion of bentgrass in the mixture of fescue and creeping bentgrass followed by the FR + AC + AS and then the mixture with fescue and colonial bentgrass. At low maintenance, the proportion between fescue and bentgrass was more balanced (data not shown). In 2021 the dominance of the creeping bentgrass was clear at high maintenance where red fescue was al-

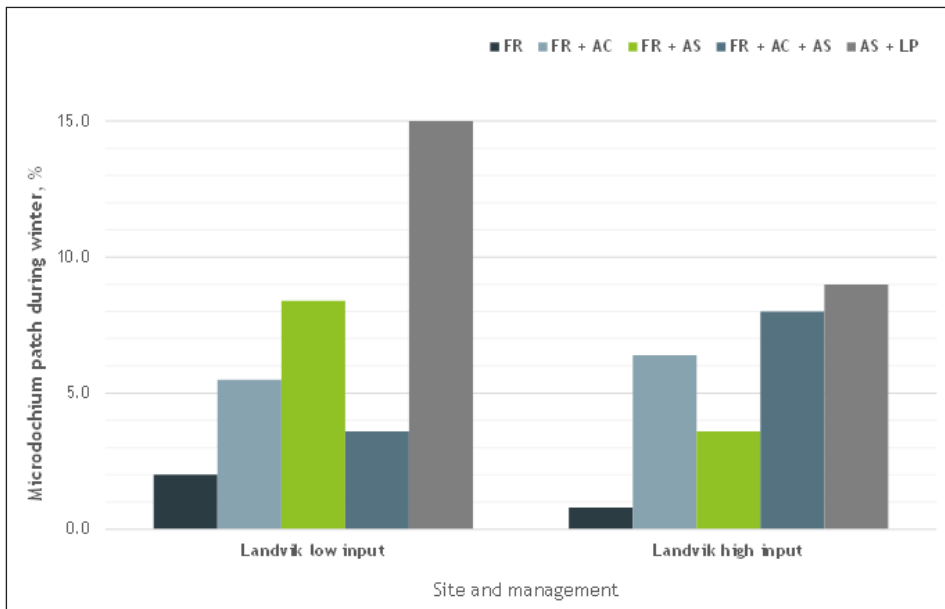


Figure 2: Coverage of microdochium patch during winter in the five mixtures at Landvik at low input (110 kg N/ha/yr and 5 mm mowing) and high input (170 kg N/ha/yr and 3 mm mowing). Black column is pure fescue blend (FR), light blue column is mixture of fescue and colonial bentgrass (FR + AC), green column is mixture of fescue and creeping bentgrass (FR + AS), dark blue column is triple mixture (FR + AC + AS) and grey column is mixture of creeping bentgrass and perennial ryegrass (AS + LP).

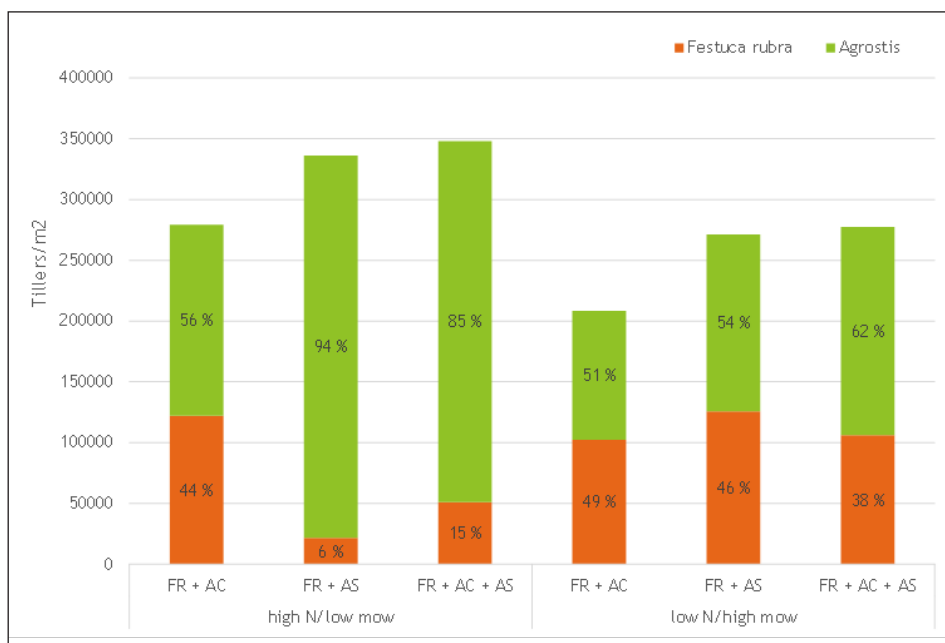


Figure 3: Tiller numbers of red fescue and bentgrass in October 2021 at Landvik in plots with the following mixtures: red fescue plus colonial bentgrass (FR + AC), red fescue plus creeping bentgrass (FR + AS), and red fescue plus colonial and creeping bentgrass (FR + AC + AS) subjected to the high N/low mow maintenance or the low N/high mow maintenance at Landvik. Figures in the bars indicate the percentage of red fescue and bentgrass tillers.

most outcompeted in the triple mixture (FR + AC + AS), and especially in the FR + AS mixture (Figure 3). In the mixture with fescue and colonial bent-

grass (FR + AC) at high input the ratio between fescue and bentgrass was balanced like the ratios at low input.

Mixing in perennial ryegrass improved establishment rate

The experiment at Landvik was sown in July 2019, while at Smørum it was sown in May 2021. At both sites the mixture with creeping bentgrass and perennial ryegrass (AS + LP) had a much higher coverage three weeks after sowing compared to the other mixtures, which resulted in a high turfgrass quality in the first year. However, because this mixture suffered from winter damage and diseases the turfgrass quality decreased after the first winter already. Mixtures with perennial ryegrass might be an option when reseeding winter-killed greens on golf courses in northern parts of the Nordic countries, but not in Denmark, southern Sweden, and coastal areas of Southern Norway.



Photo 2: Dew on the experimental green in September 2022 at Landvik. Pure varieties of creeping bentgrass to the left (heavy dew), mixtures of fescue and bentgrass in the middle and pure varieties of fescue to the right (almost no dew). Photo: Karin J. Hesselsøe

Conclusion

The best mixture combines high turfgrass quality through the season with low winter damages and coverage of microdochium patch.

At some sites and management levels the mixture with fescue and creeping bentgrass (FR + AS) performed better, but the traditional mixture (FR + AC) was more robust against changes in fertilization and mowing height than the mixtures with creeping bentgrass.

Important here is also to choose varieties of creeping bentgrass for the seed mixture that are less susceptible to microdochium patch than 'Pure Distinction'.

Among the creeping bentgrasses included in SCANGREEN, 'L93-XD' and 'Luminary' were least infected by microdochium patch on average for Landvik and Smørum. Although mixing in perennial ryegrass in the

creeping bentgrass improved establishment rate at both sites we cannot recommend this mixture for the southern climatic zone of the Nordic countries because of the decreasing turfgrass quality after 2-3 years (results from Landvik).

References:

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